American Machinist

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SPENDING TO SAVE

New surplus tax is fiscal paradox, forces business to spend in order to save, but speed is essential

BY PAYING out dividends, by disbursing bonuses, by increasing advertising expenditures, by enlarging research appropriations, American corporations have gone about escaping the 7 to 27 per cent burden of the undistributed earnings tax. But for small metal-working companies, those methods are not entirely ideal. Companies which need their cash to rebuild plant cannot gain too much solace from high, wide and handsome disgorgement of earnings. For them, some other way must be found—but speed is essential because the year is nearly up.

How, for instance, can a manufacturing company erect a new plant, or replace old machinery, without having Uncle Sam gobble up part of the ploughed-back earnings? The answer is by no means simple. But it can be done. And in effect, the government can be made a partner in the business. For the Internal Revenue Bureau instead of taking a toll, will ironically be making an invisible contribution to the plant expansion.

In instances, this "invisible contribution" can amount to as high as $17,000 for a company earning $100,000 before any taxes. The method is old, almost as old as tax laws. But today it takes on a new and a vital emphasis, because of the impact of the Revenue Act of 1936 on small firms which find it necessary to build up plant at a time when taxes make it difficult. (Larger firms with huge cash reserves can resort to the commonplace avoidance by paying higher or special dividends, or bonuses, advertising and so on).

Customarily, the government allows a company to write-off against earnings any scrapping of plant which has not been fully depreciated on the company's books. In effect, this abandonment amounts to "accelerated depreciation." Suppose a company has machinery purchased originally for $75,000, and which over the course of a few years has been depreciated $25,000, down to $50,000. And suppose further, that the machinery has become obsolete, or is not doing the job it ought to do, so that the actual worth to the company is far below its book value of $50,000—possibly as low as $5,000. Then, under this new tax law it becomes advantageous to scrap the plant and build a new one. The government will help (see tabulation on next page).

In itself, plant abandonment may be sufficient basis for a charge-off against earnings. But revenue agents are likely to be persistently inquisitive—like the man who came from Missouri. To validate, or document, the fact that the plant was actually scrapped for business reasons and not for purposes of tax avoidance primarily—it would be a good idea to begin building a new plant to take its place.

Here is a way it might work out. A company earns $100,000 before taxes. It decides it cannot pay any dividends because it cannot spare the cash. Then its tax bill will be $31,000. But the company has a plant valued at $50,000, but which is virtually worthless from the standpoint of efficient operation. So, the company starts to scrap the plant, put up a new one at the same cost. The net result is that earnings have been reduced to $50,000 and taxes to $15,163. The tax saving is $16,340 and hence the actual cost of the new $50,000 plant would be only $33,660 to the company.

As a matter of fact, it would not be necessary to use the entire $50,000 of abandoned plant value to erect a plant. If, for instance, a $25,000 replacement job will do the same work as the obsolescent $50,000 equipment that should satisfy not only the company, but also the revenue bureau. Then, the government would be contributing—invisibly of course—some $16,000 toward construction of a $25,000 job.

In the final analysis, it comes down

to a matter of value. No set rule can be laid down. Each company must work out the problem for itself. Clearly, it would not pay to scrap a plant worth, say, $25,000, in order to save $16,000 in taxes—even though that plant happens to be valued on the books of the company at $50,000.

The amount of tax saving is not cut and dried. Dividends come into the equation. If, for instance, a company pays out all its earnings in dividends, then the amount of saving in taxes from scrapping $50,000 in equipment would be substantially reduced. For a company earning $100,000, the tax reduction (see table) would amount to only $7,500—which would be represented by a saving on the normal tax only. There would be no undistributed earnings tax.

There are two ways to compute the saving. One is based on an assumed static percentage of earnings paid out in the form of dividends. Thus, a company earning $100,000 would be assumed to pay out say 50 per cent of income after the normal tax. That would amount to dividends of $43,080 and would leave total taxes of $20,302. Then, that same company, after scrapping $50,000 in equipment, would be assumed to pay out half of its income on the same basis. That would mean dividends of $21,830. The tax reduction would be $10,783.

The second method is to assume that approximately the same number of dollars are distributed to stockholders in the form of dividends. Then, though the tax before scrapping plant would be unchanged, the higher percentage of dividends after abandoning plant (in relation to earnings) would extinguish all of the undistributed earnings surtax and the impost would be $6,340. Net consequence: a tax saving of $13,962 which could be used toward building new plant capacity.

Absorb Subsidiaries

Simplification of corporate structures is another evasion. By absorbing subsidiary companies, the tax on intercorporate dividends (amounting to the regular taxes of 15 per cent of dividends received by the parent company) is eliminated.

There is a possibility, of course, that Congress may eliminate the undistributed earnings levy or modify it. That, however, is assuming a great deal.

And, therefore, business should be prepared to proceed on the basis that the law, largely in its present form, will remain on the statute books. There will be no permanent form of evasion of taxes. There never has been. By scrapping plant, for example, a company will soon eliminate all so-called scrappable or obsolescent machinery.

Nor can advertising appropriations, or wage increases, or bonuses, or larger dividends. Some conservatism will be necessary sooner or later. Paper capital structures cannot be reared endlessly by paying dividends in stock. Nor can cash be paid out freely year in and year out. In short, business faces a condition, not a tax theory. And it is on the conditions, or terms of the new law that it must work out its salvation. In the long run, this means—as always—seeking new ways to lessen manufacturing and distribution costs, developing new products, exploiting new ideas. Taxes will be with us, in one form or another, and if a company finds a way to beat them one year, it cannot count on beating them another year in another way.

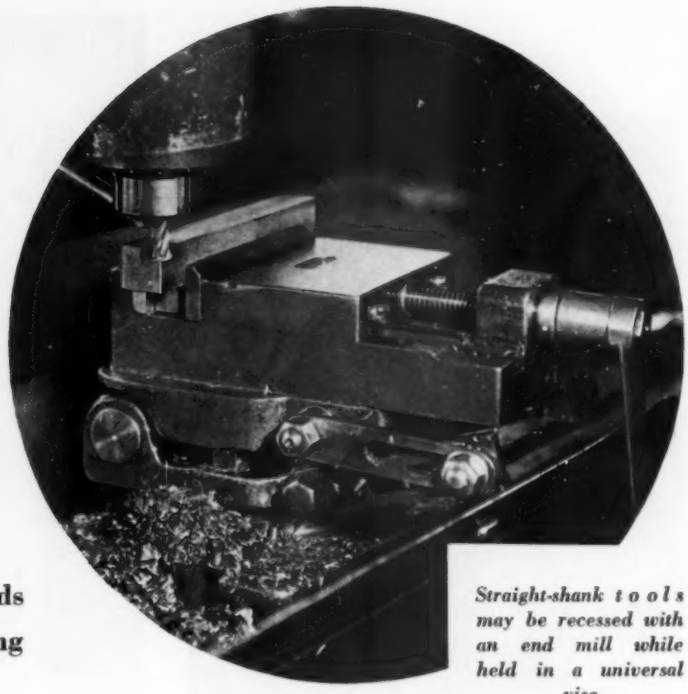
Scrapping Old Plant—A Way to Save Taxes

ONE WAY for a manufacturing company to take the sting out of the new tax law is to scrap old plant and build anew. The amount of scrapped plant value can be offset against earnings — thereby reducing them. The following tabulation shows how a company earning $100,000 can save taxes by scrapping $50,000 in plant and equipment based on a set percentage of earnings paid out in dividends. Savings shown at right.

Company with $100,000 Earnings Before Federal Taxes					Same Company After Lopping $50,000 Off Earnings by Junking Plants					
		FEDERAL TAXES					FEDERAL TAXES			
Dividends* %	Dividends* in Dollars	Normal	Undistributed Surtax	Total	Dividends* %	Dividends* in Dollars	Normal	Undistributed Surtax	Total	Tax Saving
0	——	$13,840	$17,663	$31,503	0	——	$6,340	$8,823	$15,163	**$16,340**
10	$8,616	13,840	15,336	29,176	10	$4,366	6,340	7,645	13,985	**15,191**
20	17,232	13,840	13,010	26,850	20	8,732	6,340	6,466	12,806	**14,044**
30	25,848	13,840	10,684	24,524	30	13,098	6,340	5,287	11,627	**12,897**
40	34,464	13,840	8,358	22,198	40	17,464	6,340	4,140	10,480	**11,718**
50	43,080	13,840	6,462	20,302	50	21,830	6,340	3,179	9,519	**10,783**
60	51,696	13,840	4,566	18,406	60	26,196	6,340	2,251	8,591	**9,815**
70	60,312	13,840	3,102	16,942	70	30,562	6,340	1,508	7,848	**9,094**
80	68,928	13,840	1,637	15,477	80	34,928	6,340	798	7,138	**8,339**
90	77,544	13,840	603	14,443	90	39,294	6,340	306	6,646	**7,797**
100	86,160	13,840	none	13,840	100	43,660	6,340	none	6,340	**7,500**

*Based on a percentage of net earnings after normal income tax.

TIPS on CARBIDE TIPPING



Straight-shank tools may be recessed with an end mill while held in a universal vise

A braze that won't break depends on a trim fit and careful cleaning

FRANK W. CURTIS
Manager, Firthite Division
Firth-Sterling Steel Company

IN MAKING carbide-tipped tools of the straight-shank type, brazing is an important consideration. But regardless of how well brazing is carried out, the carbide tip will not hold as it should if it is not fitted properly into the milled recess or if the surface of either the tip or the shank is not clean.

In milling the recess, all surfaces should be smooth and free from cutter marks. Above all, the bottom face of the recess should be extremely flat so that a proper contacting fit can be made between it and the carbide tip. The shank is held in a universal vise which can be adjusted to different angles for milling various styles of tools.

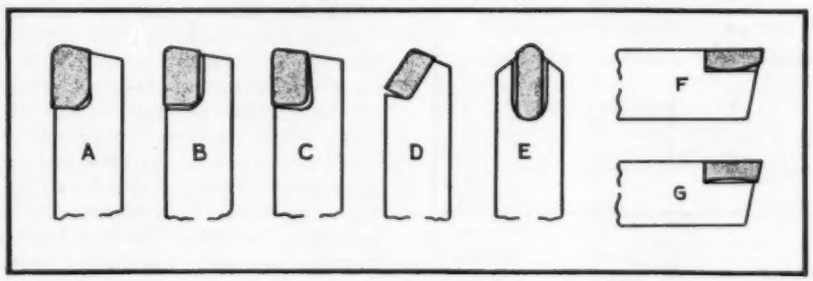
In roughing out the recess of a shank, the end mill is likely to deflect slightly. For this reason, two or more cuts should be taken, the last of which should remove a few thousandths of an inch from the bottom and edges. At *A* is shown a common condition which results when too much material is removed on the last cut. The end mill has a tendency to dig into the shank when the feed is disengaged, causing a poor fit at the fillet radius. This is perhaps one of the least harmful conditions but nevertheless it should be overcome. *B* shows another condition which may exist through the use of an end mill proportionately larger in size than the fillet radius of the carbide tip. When this happens, the tip will not fit firmly into the recess, and the brazed joint will be greatly weakened.

The sides or edges of the recess should be straight and flat as well as the bottom surface. At *C* is shown a condition, also likely to occur, in which one side of the recess is milled out of line with the shape of the tip to be brazed. Recesses at *D* and *E* are other examples of incorrect milling which should be avoided.

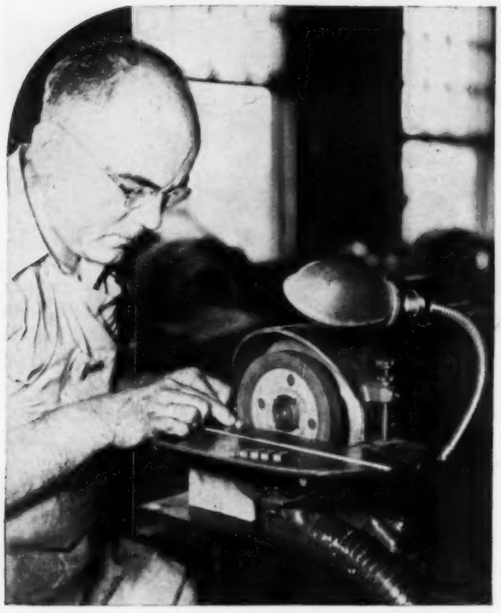
The next operation is the fitting of the carbide tip to the recess. Sintered carbide tips are usually quite accurate in shape and size but require some grinding on all surfaces that are to be brazed. These surfaces should be ground flat and smooth so that the tip will fit correctly into the recess. This operation can be satisfactorily done in a bench- or pedestal-type grinder, preferably equipped with a diamond-type wheel. Charged wheels of this kind grind rapidly, and the average tip can be fitted to a properly milled recess in from two to four minutes.

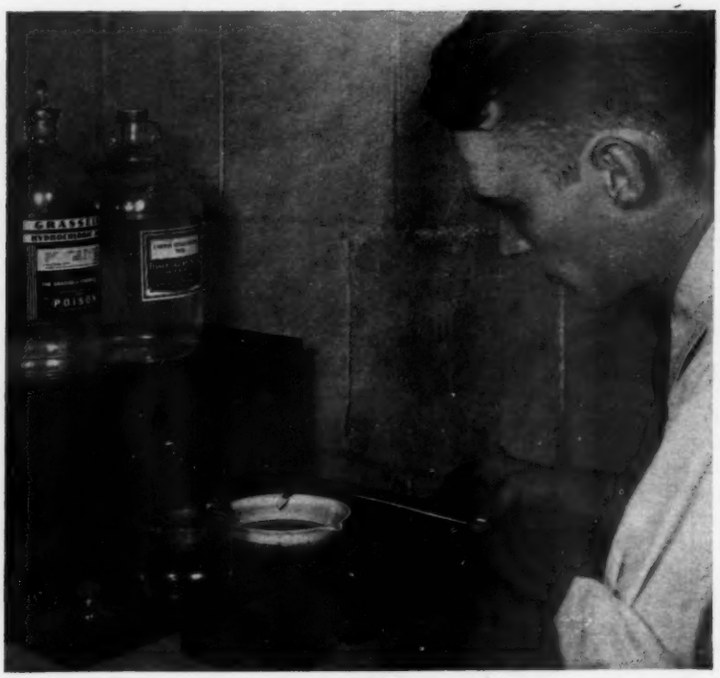
An inspection of both the shank and the tip should be made before proceeding. This can be done by placing the tip into the shank, pressing it firmly in place, and then holding the tool to the light. If the fit is correct, no light will appear through any of the fitted joints. Another way is to use a thin feeler gage (0.0015 in.) and pass it around the joint, both underneath and on the edges. The feeler should not enter at any place. Be sure the tip does not "rock" in the recess, as might occur if the bottom surface of the tip were not flat. An example of this kind is shown at *F*. If a tool were brazed in this condition, the contact between the tip and the shank

Conditions that result in poor tip fits may seriously shorten tool life



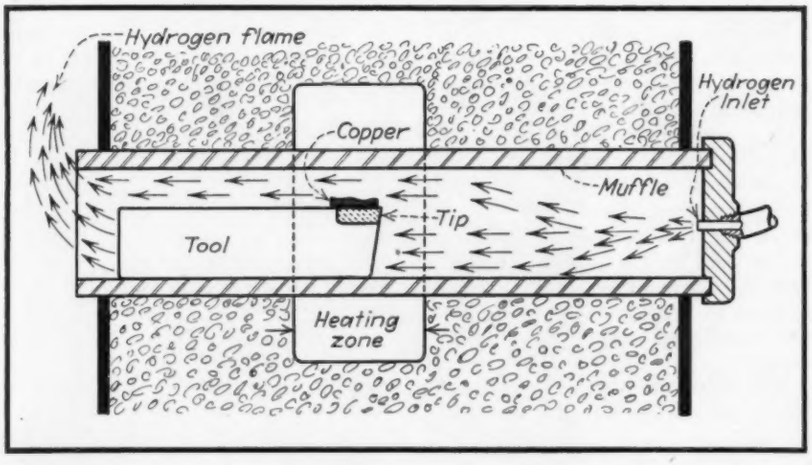
Diamond-charged wheels speed up the work of flattening and forming the tip surfaces

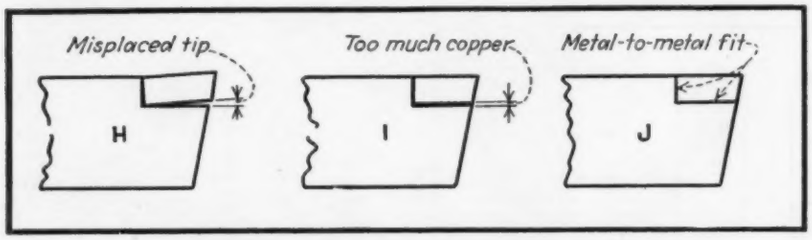




Both shank recess and tip are cleaned prior to brazing in successive rinses in solutions of HCl and C Cl4

The tool is placed in an insulated muffle at the center of the heating zone



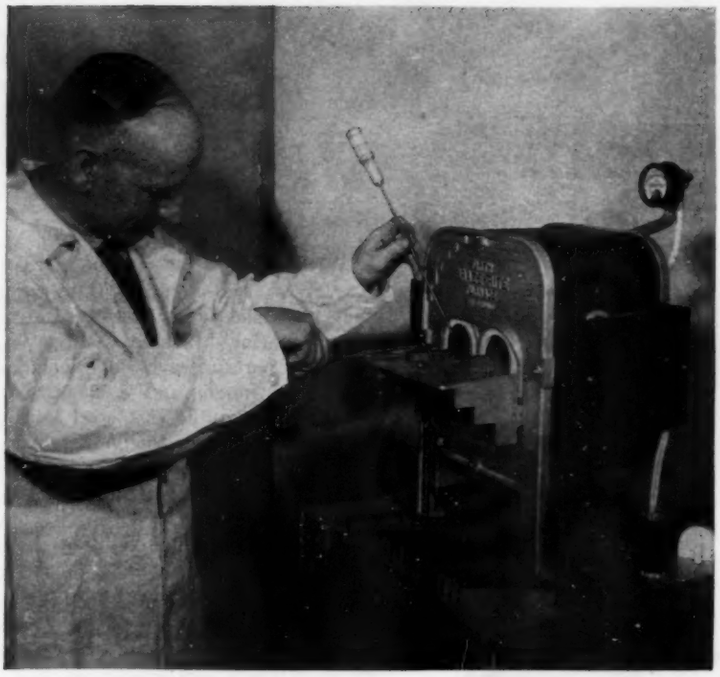


A misplaced tip H or too much copper I will work against the correct close contact J

would be at only one point, and excessive copper would be deposited at both ends. A condition as that at *G*, in which the bottom surface of the tip is concave, is also objectionable. The use of a small straight edge or scale will assist in inspecting tips prior to brazing. Remember that the better the contact the better the braze.

Next in line is cleaning. For this operation, a 50 per cent solution of hydrochloric acid and a straight solution of carbon tetrachloride are used. First, the tip and the recessed end of the shank should be submerged in the hydrochloric acid for a few moments. This action will clean off any rust, oil or dirt which may be lodged on either part. Then the tip and the shank should be rinsed in carbon tetrachloride. This will clean off any traces of acid and will produce a bright, clean surface. Both parts should then be wiped dry with a clean cloth, after which they will be ready for brazing.

Heretofore, most tool brazing has been done by placing a piece of thin sheet copper on the underneath side of the carbide tip and around the entire recess, and then wiring the tip into place on the shank. The tool was then advanced through a furnace, having a long muffle, in increments from a preheating chamber to the heating chamber and then to a cooling cham-



When the molten copper runs into the crevice between shank and tip the tool is withdrawn for a moment while the tip is pressed into place

A final grind after the braze makes the tool ready for service

ber. This method, however, has not been entirely satisfactory because often too much copper was deposited around the contacting surfaces of the tip. If the tool were used under severe conditions the excessive heat or the pressure of the cut had a tendency to loosen or squeeze out the copper, with the result that the tip would come off or break. The latest method of brazing, however, is carried out through the use of a smaller furnace, equipped with a short muffle and arranged so that the tool is placed into the center of the heating chamber within reach of the operator at all times.

Here's How It's Done

The operation is carried out in the following manner. The recess of the shank is coated with flux, having a borax base, and then inserted into the heating chamber so that it can be preheated to about 1400 to 1500 deg. F. The shank is then withdrawn from the muffle and the tip is placed into the recess. Directly on top of the tip is placed a small piece of sheet copper, usually about 0.003 in. thick, having an area of about four or five times that of the carbide tip to be brazed. This copper is doubled over so that it is slightly larger than the tip itself. The tool is then inserted into the furnace chamber and allowed to heat beyond the melting point of copper. Since copper melts at 1985 F., the brazing temperature should be approximately 2050 to 2075 F. When the copper melts, it will be seen to run throughout the crevice between the tip and the shank. At this point the operator withdraws the tool and firmly presses the tip into place with a flat blade, resembling a file, squeezing out any excessive flux or copper which may be lodged underneath. When this is done, however, the tool is allowed to remain in the chamber so that there will be no chance of oxidation.

The furnace is controlled electrically and is equipped with a direct reading pyrometer. Hydrogen enters through the rear of the muffle and burns out at the front in order to offer a reducing atmosphere thus preventing oxidation of either the shank, blank or copper while brazing. A furnace of this type can be brought up to temperature in approximately 30 min., which makes its use practical for either small or large quantities of tools. The muffle is completely insulated excepting at the heating zone through which the electrical elements pass.

In brazing tools, it is necessary to press the tip into the recess so that it will fit as it should. A small amount of practice will avoid errors; it is well to guard against pressing the rear of the tip so that a condition such as shown at *H* will exist in which the rear end of the tip seats firmly into the shank but the front is raised up, allowing an excessive amount of copper to lie under it.

Correct brazing requires a good metal-to-metal contact between the recess of the shank and the carbide tip with a small amount of copper between. If an excessive amount of copper exists, as at *I*, the braze will not be satisfactory. The fit should be as shown at *J*, in which the contact is as close as possible.

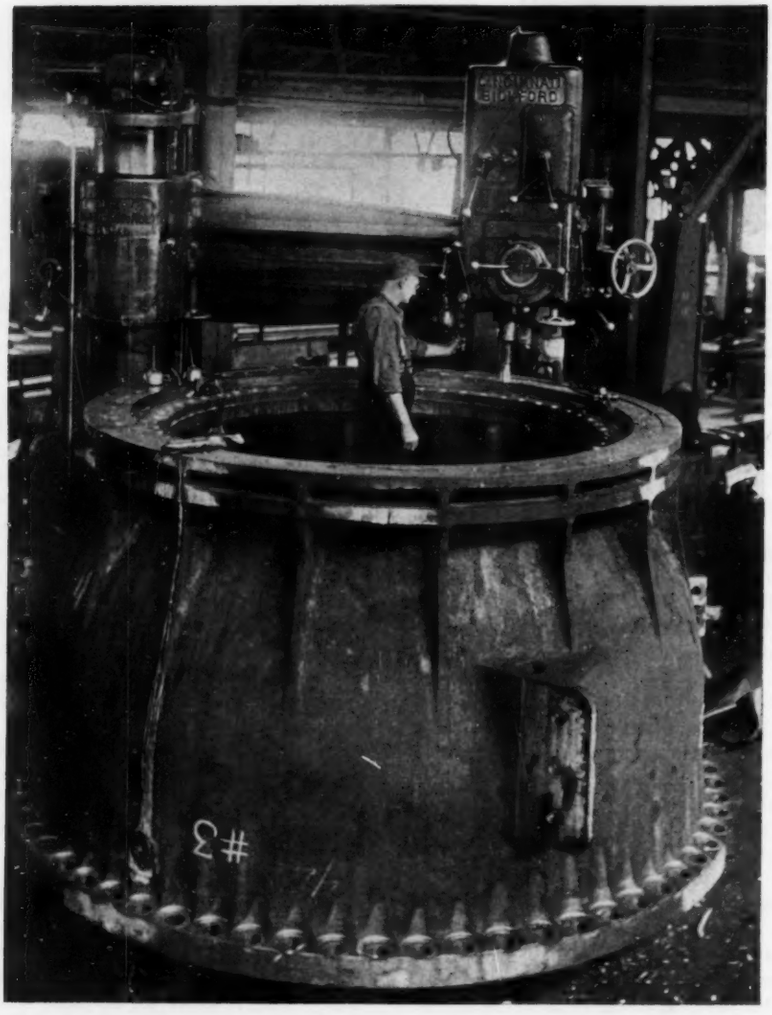
After a tool is brazed, it is submerged in powdered bone carbon or mica so that it will cool slowly, thus avoiding excessive hardness of the shank. The tool itself will cool in a short period of time and then will be ready for grinding. With proper fitting, correct recessing, and care in brazing, the average tool can be completely sharpened, ready for use, in a few minutes.

Results have shown that of an extremely large quantity of tools brazed in furnaces of this kind failures have been reduced to far less than one per cent. This is quite an advance when consideration is made of many failures in the past which could be traced to poor brazing.

BIG VALVES for Boulder Dam

Machining in a big way is needed to prepare parts for 60-ton penstock outlets

M. K. MELLOTT



In this machine a total of 176 holes are drilled for the parts of each valve, including tapping the 2¼-in. nozzle section stud holes (as shown), and counterboring and spot facing for the flange bolts

TWELVE 72-in., 60-ton needle valves for Boulder Dam are being machined and assembled by Thomas Spacing Machine Company.

Principal parts of each valve include a 38,000-lb. nozzle and a 35,000-lb. body which form the cast steel housing; a bronze needle body weighing 10,000 lbs.; a bronze diaphragm tube 7 ft. 6 in. long with an outside diameter of 24½ in. weighing 7000 lbs.

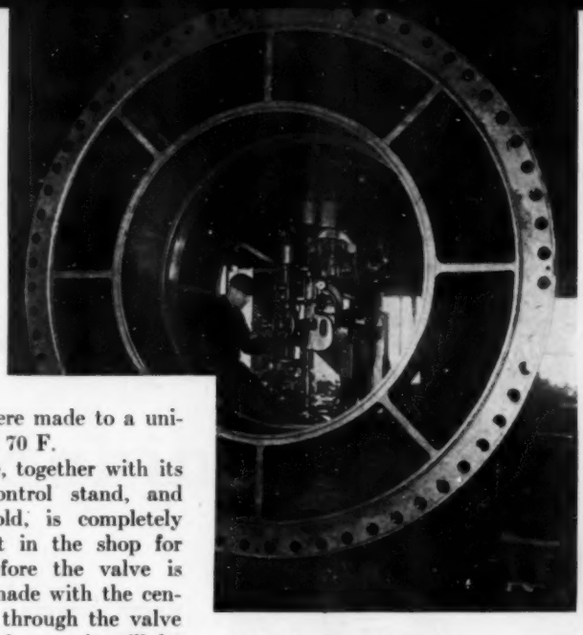
The two sections of housings for each valve are bored out and counterbored, and 64 2 ⅞-in. holes are drilled in each central bolting flange. To insure perfect matching of holes in these mating parts, a ring-shaped jig with an outside diameter of 138 in. was made; also, approximately 50 other jigs, varying in size and shape, for use in drilling the more than 1000 holes required in each valve.

Each bronze needle body, which is 42 in. long with an outside diameter of 77 in., has ¼ in. of stock removed to form a wall thickness of 2⅝ in. It is worked on a vertical boring machine using a wide tool in order to eliminate tool marks; further finish is developed by use of emery cloth. The bronze diaphragm tube, which is 90 in. in length, is machined 1-in. to an outside diameter of 24½ in.

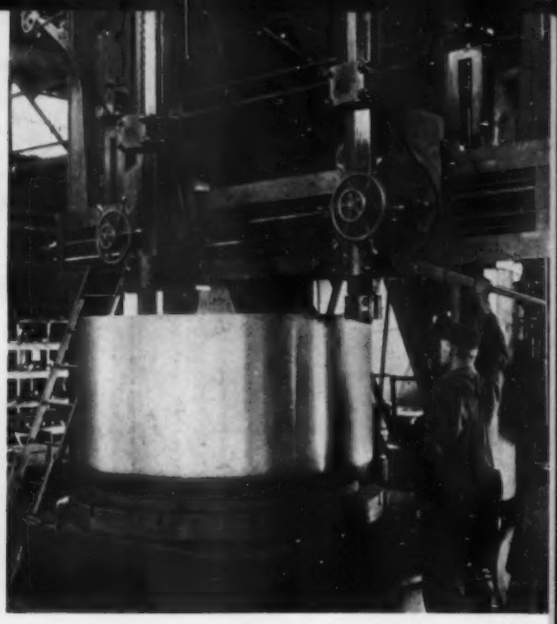
Nozzle seats and seat retainers are bored 0.005 in. eccentric on their common vertical center line to compensate for the position of the needle when fully closed due to clearance in the needle guide intended to allow for sagging of the 20-ton moving part when it slides outward in the valve housing.

Special rigging was required in working the 71¾-in. bronze piston ring used in each valve. These rings are separated in the middle and sprung similar to an automobile piston ring. This rigging was necessary to hold the rings in position for assembly.

Dimensional changes due to temperature were carefully considered in establishing the limiting size of mating parts; where necessary, gaged dimensions were taken with the part maintained at a uniform temperature of 70 F. Where several pieces to be fitted were gaged at different temperatures, corrections based on the thermal coefficient of expansion or contraction of



An inside job—One of the many drilling operations on the valve housing is done with the casting mounted on trunnions



the material used were made to a uniform temperature of 70 F.

Each needle valve, together with its paradox control, control stand, and air breather manifold, is completely assembled as a unit in the shop for testing purposes before the valve is painted. Tests are made with the centerline of axial flow through the valve in a horizontal position, as it will be when the valve is in operation, and with temporary piping from a source of water supply connected to the paradox control and electrical connections made to the control stand motor and mercury limit switches.

The needle plunger is then completely filled with water, and under pressure of 400 lbs. per sq. in., the valve is operated several times throughout the full travel of the needle to insure proper functioning without binding of any part.

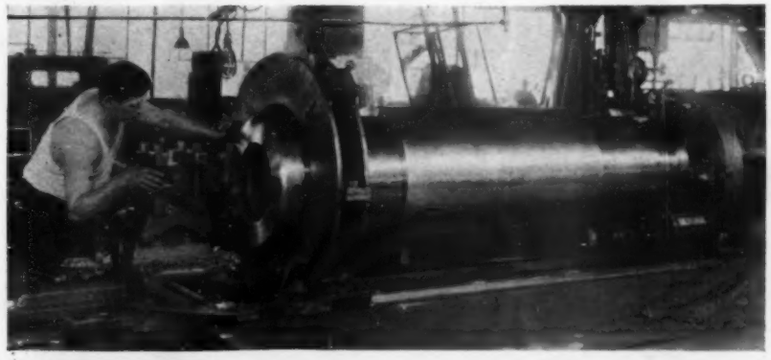
Gearmotors for electrical operation of the control stands are of the ¼-hp. normal-torque, low starting current, squirrel cage, induction, vertical type, designed to operate on a 220 volt, three-phase, 60 cycle current at a synchronous speed of 1725 r.p.m.

Each control stand is furnished with a limit switch which will act as an interlock in the operation of the emergency gate immediately upstream from the needle valve when installed in the dam and a Stoney gate closing the downstream end of the discharge tunnel. Each control stand is equipped also with mercury switches to act as limit switches for the control stand motor to guard against over-travel of the drive mechanism in either direction. When installed, the control switch will be 14 ft. above the valve. The valve will operate by hydraulic action, once the water is admitted to its mechanism, and stops as soon as the water is shut off.

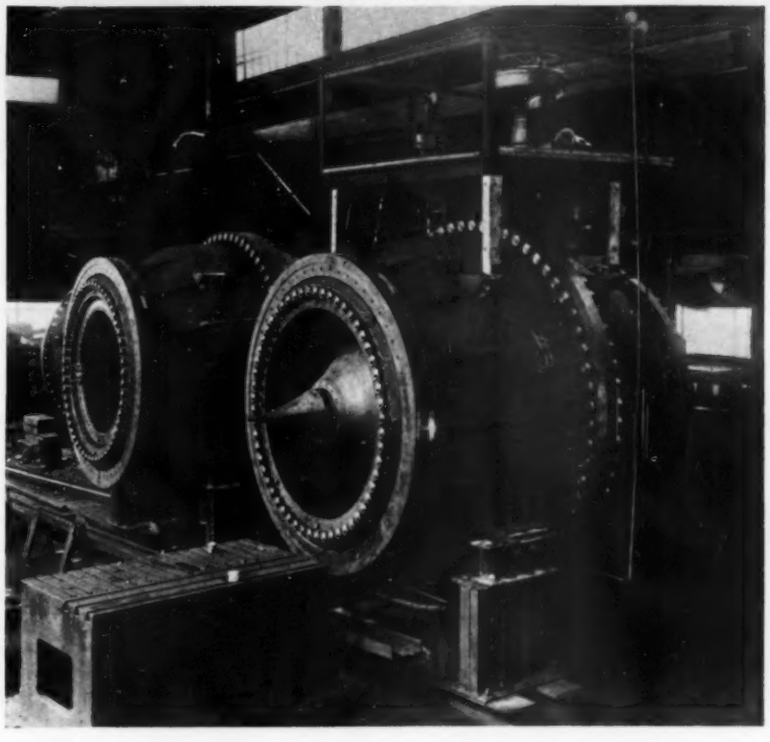
The valves will be used in regulating the amount of water drawn from the reservoir at Boulder Dam. In open position, 3000 cu. ft., or 25,000 gal. of water per min., pass through the valve at a velocity of 80 m.p.h.

One battery of six valves will be placed in each of the two tunnel plug outlet works located, respectively, in the lower Arizona and the lower Nevada penstock tunnels.

(Below)—Length 90 in., diameter 24½ in., the 7000-lb. bronze diaphragm tube is faced in an engine lathe



(Bottom)—Each of the 72-in. needle valves is completely assembled for test before shipment to the dam



(Above) — The 10,030-lb. bronze needle body is rough and finished turned in a vertical boring mill; dimensions, 42 x 77 in.

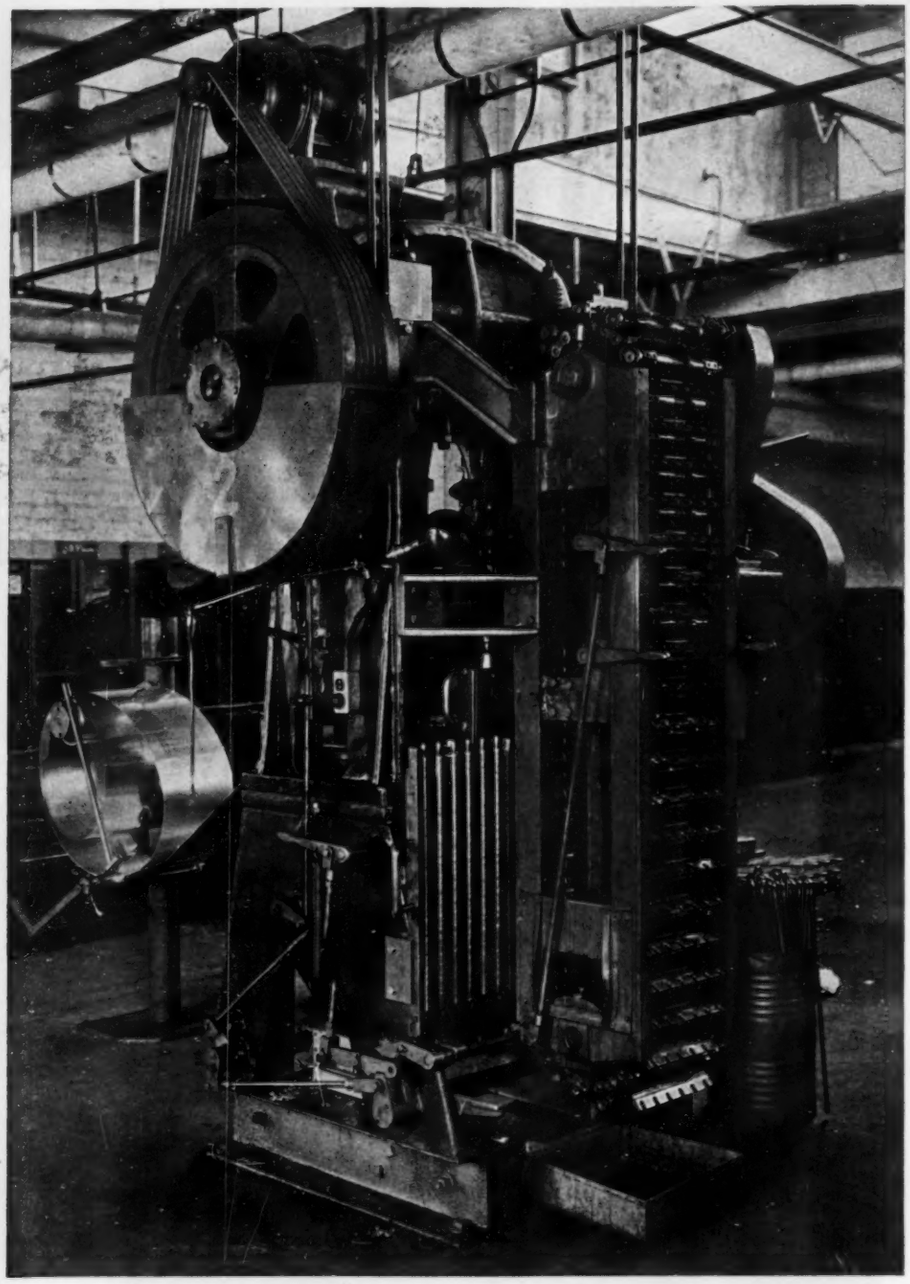


Fig. 1—Just behind the rear column face of the press is a condenser shown pulled out to the unloading position. It has been assembled by two mechanisms fitted to the press

Fin

SOMETIMES it is comparatively easy to make the separate parts of a product, but much more of a problem to put them together ready for use. A case of this kind is the condenser for the Electrolux refrigerator which closely resembles an automobile radiator of the fin type. The fins are cut from coil stock, whose width is the length of the fin. The fins are punched and drawn at the same stroke, the holes being small enough to allow for drawing a collar around each hole, which acts as a spacer between the fins when assembled.

After each fin is cut it is fed to the back of the press by a mechanism driven from the press crankshaft. Back of the press opening is a frame that supports the six tubes of the condenser in proper position. A removable steel point is inserted in the upper end of each tube to guide the fins over the tubes.

As each fin is fed over the tubes it is forced down by the notched pressure bars in a rack behind the machine. These bars move continuously while the press is in operation, those on the side next to the press moving down. The endless chains carrying the bars are turned in unison with the press by a chain drive from the crankshaft. Drive for the cross feed of the fins is also obtained from the crankshaft.

Just So Far—No Farther

In feeding, or forcing, these fins on the tubes the problem is to push each fin just the right distance and no farther. The first fin must go to the bottom of the tubes, but each succeeding fin can only be forced far enough to contact the collars around the holes of the fin below. To do this the notched pressure bar in contact with any fin must be tripped and cease to exert pressure as soon as the fin reaches its correct position on the tubes.

Some of the details of this indexing, or spacing, mechanism are shown in Fig. 3. Ball bearings are used very liberally, both to guide the pressure bars and for the contact that actuates the indexing lever *A*, and through it the bellcrank *B*. With lever *A* pivoted at *C* and bellcrank *B* pivoted at *D*, it is plain that the pawl *F* will be forced down, and because its toe is held in the ratchet by a spring at the other end, the whole block carrying the levers is moved upwards.

Assembly by Machine

Individual fins of refrigerator condensers are easily damaged in hand assembly, but not so when the operation is done right at the press by special mechanisms

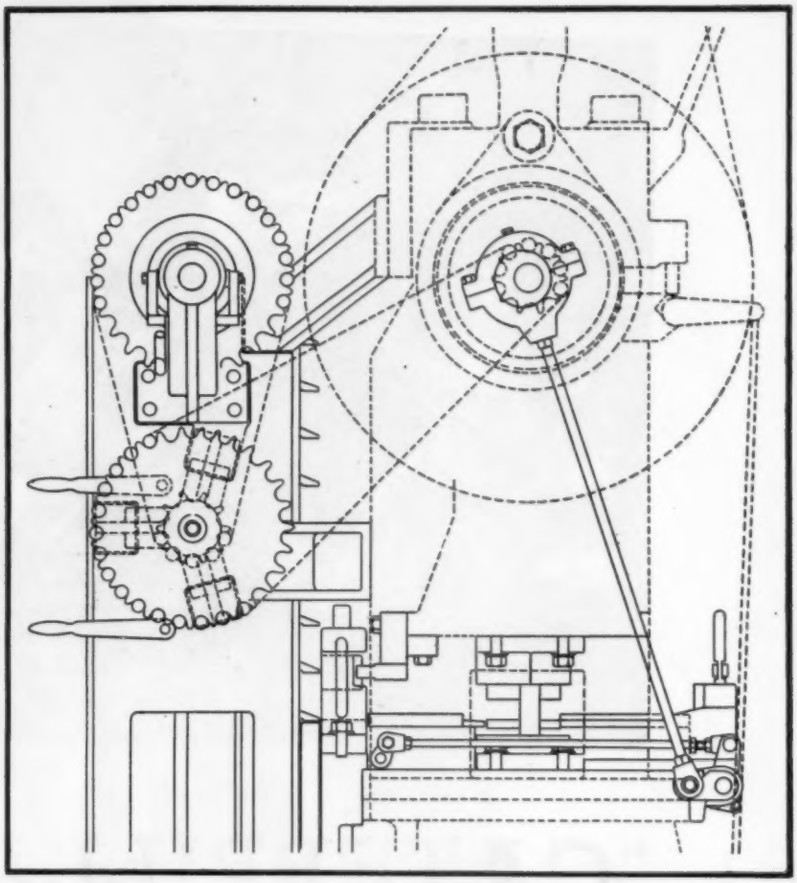
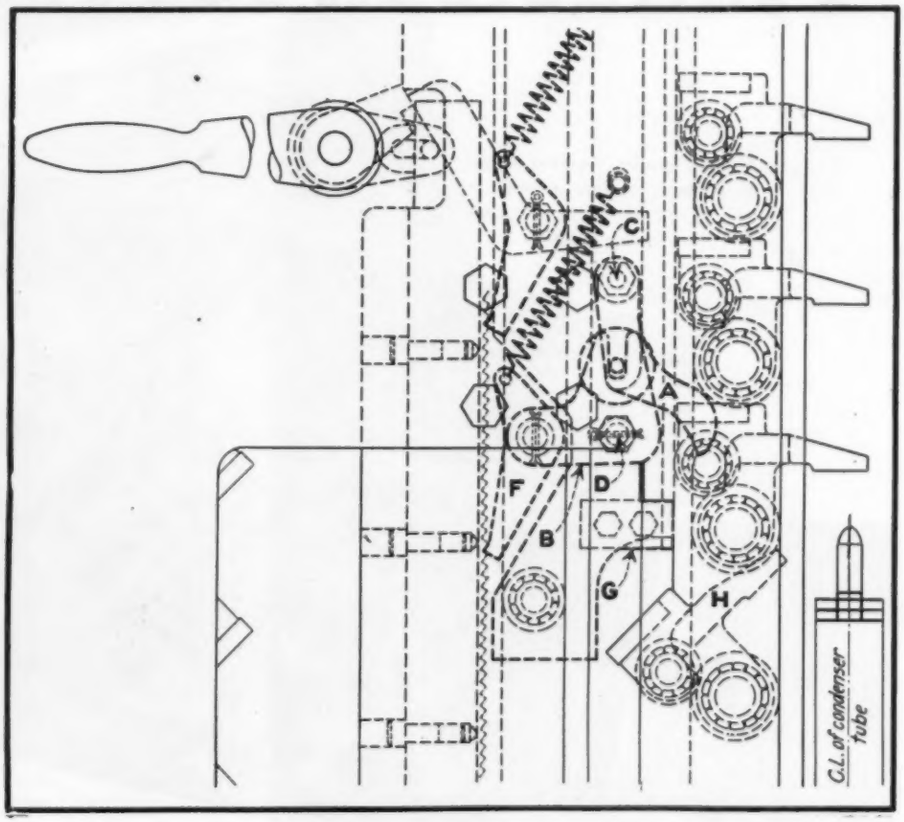


Fig. 2 (Above)—A side elevation of the press bed shows the cross feed for transferring the punched fins to the assembly station located at the rear

Fig. 3 (Below)—As each fin is stacked on the condenser tubes and pressed down firmly, a double-pawl mechanism moves up to suit the height for the next fin



This block carries the abutment *G* that regulates the point at which the notched bar is tripped to release pressure on the fin that it has forced down on the tubes. As soon as the moving chain has carried the pressure bar beyond block *G*, a torsion spring at the center of the bar forces it backward outside the line of the fins, as seen at *H*. The second pawl, above *F*, acts as a safety at all times and prevents any dropping of the block which controls the spacing of the knock-off for the pressure bar.

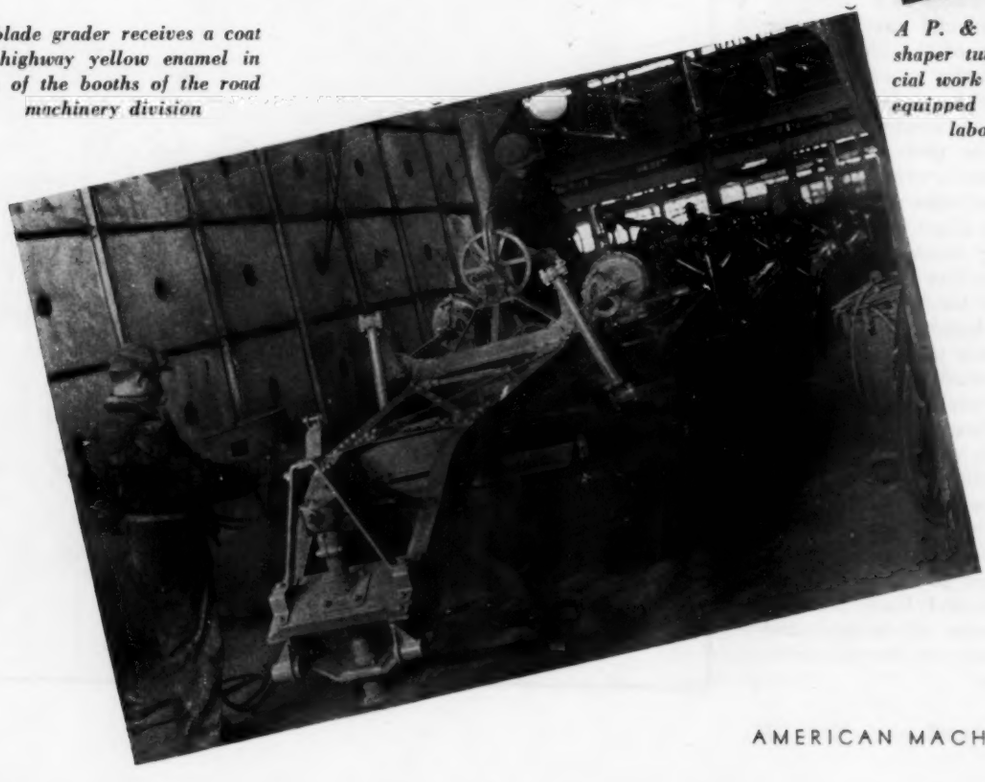
After the condenser is completed the press stops. The condenser is then removed from the frame and a new set of tubes is put in place. The indexing mechanism is next reset so that the first fin of the new batch will be forced to the bottom of the tubes. Means are provided for making these adjustments quickly by the various levers shown. They also permit changes to be made without delay.

In addition to saving an immense amount of time, this method of assembling the fins on the tubes of the completed condenser gives more uniform spacing, and there is much less chance of damage than when they are forced in place by hand.

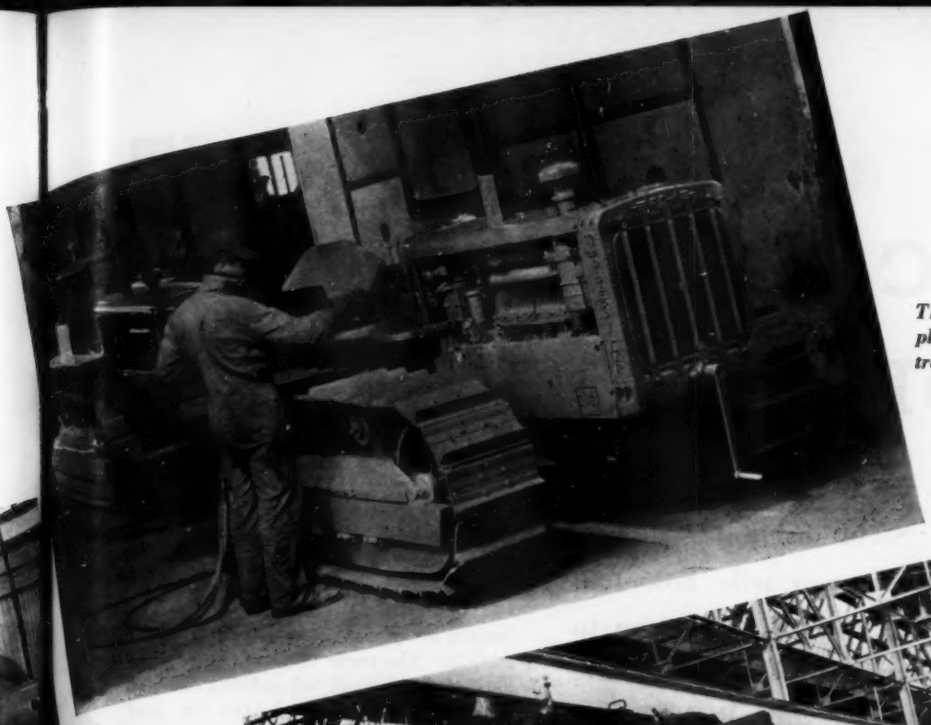
Parts of the main frame of an Auto Patrol are applied by welding

"CATERPILLAR" Products in Process

A blade grader receives a coat of highway yellow enamel in one of the booths of the road machinery division

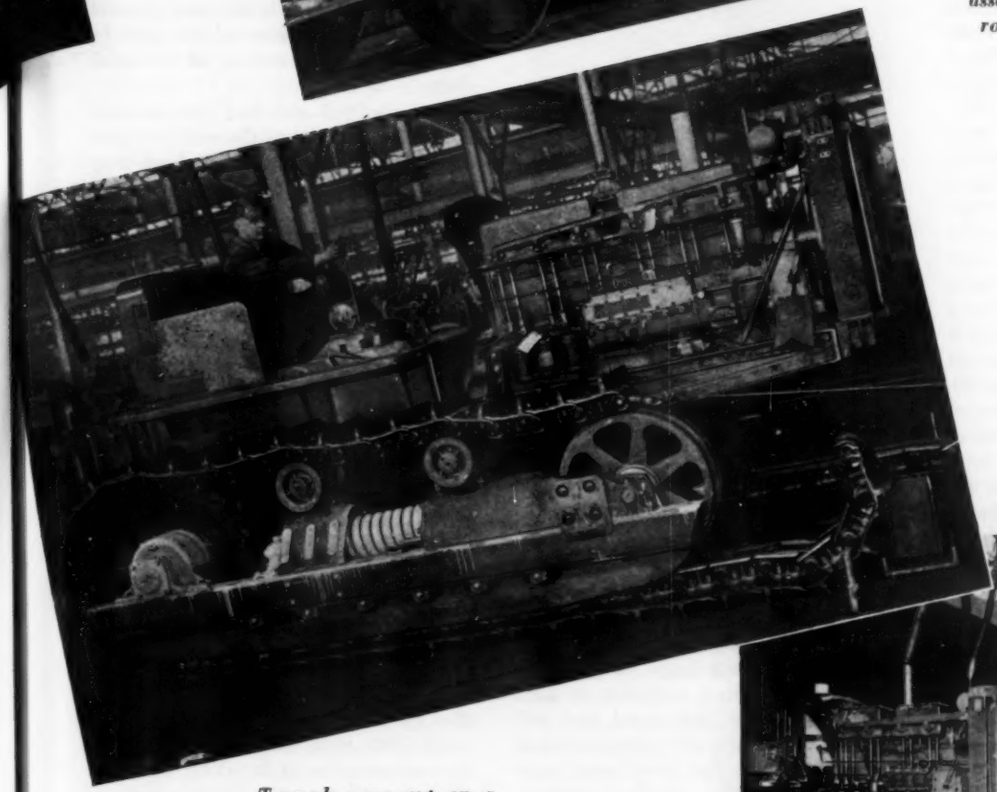


A P. & W. vertical shaper turns out special work in the well equipped emergency laboratory



The finish coat is applied to a Caterpillar tractor in a modern spray booth

Elevating graders are assembled along the road machinery line



Tracks are put on a Caterpillar diesel tractor

Run-in stands give opportunity for final tests to insure smooth operation

CHILL CAST TOOLS

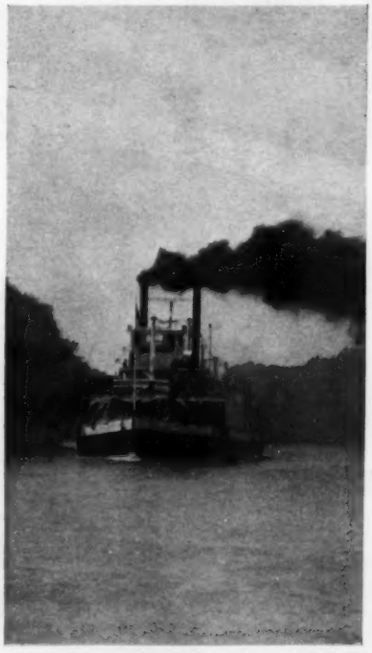
"Scrub machinist" of fifty years ago tells how tool was cast of white iron to handle difficult machining job for Ohio River steamboat cylinders

C. G. WILLIAMS

IN HIS ARTICLE, "Fifty Years a Scribe" (*AM*—Vol. 80, page 289), Fred Colvin touches on a subject that has been with me since those days when, as a boy of ten, I went into a little machine shop on the banks of the Mississippi River as an apprentice to learn the machinist trade. There I was set to work on a 42-in. lathe boring out a cylinder for a Mississippi River steamboat. Those cylinders were 16-in. bore and 7-ft. stroke. After that came cylinders of 12-in. bore and 8-ft. stroke and on up to 34-in. bore and 12-ft. stroke; but the crowning event of those days was when the little shop took the contract for a set of four cylinders for a large Ohio River towboat from a Pittsburgh firm. Those cylinders were 32-in. bore by 12-ft. stroke for the two high-pressure cylinders and 60-in. bore 12-ft. stroke for the low-pressure cylinders, the engines being tandem compound and the boat a stern wheeler.

The contract called for a white iron as hard as could be machined, and they got it. The metal was so hard that Mushet steels, for which the owners of the shop had sent to New York and paid the then unbelievable sum of two dollars a pound, would not even touch it. Recourse was had to some of that cylinder metal cast to the shape of a tool in a chill. This tool was so hard that when the edge was struck with a hammer, it flew like glass, but it left a deep mark in the face of the D. Madole machinist hammer, and we of those days considered it the acme of perfection. Those old cast-iron tools would cut that white cast metal like cheese, and we worked that lathe to the full extent of its capacity, for we were fighting against time. There was a limit on delivery of the cylinders which were to be shipped by water to Pittsburgh. Many a time since then I have advocated the chilled white cast-iron tool to cut hard cast iron, sometimes to be ridiculed, other times to have the idea considered.

One thing I should point out is that such a tool will not cut steel at all. It will not save time over a carbon-steel tool for soft gray iron, and its efficiency does not begin to show up until it is used in a cast iron so hard that the average high-speed tool will burn up on it. Its only competition is the carbide tools that have been introduced since 1929. Stellite, another cutter of hard cast irons, was 20 years before its time. Had the makers of that material spent the money in experimenting for perfection of use, had any maker of machine tools worked for vibrationless tools as has been done by the sellers of the carbides, we would have found Stellite efficient as a machining material in cast iron.



Courtesy, 20th Century Fox

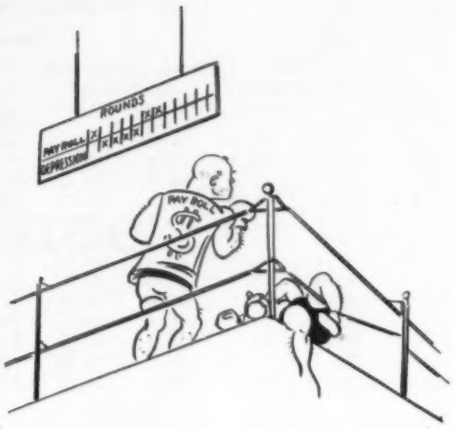
Last winter, when in a small shop employing only six machinists, the owners taking their turn on the machines, I saw every one literally sweating blood over some hard cast iron that had been furnished on contract. One young partner, a graduate of the engineering department of a large university pooh-poohed the idea of cast-iron tools. In talking over the ills of the shop with an old uncle who had been a machinist, he spoke of the suggestion. The uncle had used such tools long ago, but could tell nothing of their production so I was looked up and asked to call at the shop.

A foundry having a small electric furnace contracted to make one small heat of an exceedingly hard white cast iron and cast some tools if the partners would furnish the chills. Of course the tools were large and rough looking in comparison with the ground bits used in the shop, but they did the work required of them so as to allow the partners to make a nice profit on their contract and still pay a reasonable fee for the suggestion. And there was some difference in the cost of white cast iron and carbides which must be considered by the owners of the small shop.

And you will still find the cast-iron tools in small out-of-the-way contract shops, doing their duty as best they can though they get no acclamation.

I would like to refer shortly to another brought up by Mr. Colvin, that of casehardened tools, not carburized, but casehardened with cyanide—boiled in cyanide, cooled and boiled again. I wonder if Mr. Colvin or any of the readers has ever tried making this tool out of some of our S.A.E.'s that are alloys of nickel and chromium or nickel and molybdenum or any of the alloys used in automobile construction. I have found them most valuable in a shop when the foreman suddenly found that the tool bits had run out and a special shape needed to be made. Some folks would be surprised at the amount of work that can be turned out by and with such a tool. I have found that all of our lathes can be worked to their capacity with such a tool providing that the machine has not been designed since 1929 with an eye to using the various carbides in it. Yes, there are tricks to all trades, although some of them have been forgotten.

The Payroll Stages a Comeback



In the first years of recovery payrolls in the machinery industries lagged behind employment, but recent gains have nearly restored the prosperity ratio

LEWIS M. LIND
Acting Chief, Machinery Division
U. S. Department of Commerce

PAYROLLS of workers in the machinery industries are catching up with re-employment. During the latter days of NRA the criticism was often heard that there was a tendency to spread available wages as well as to spread work, which resulted in a smaller average sum in the pay envelope of the man who had been continuously employed. That this was true in some cases cannot be doubted. During the days following the President's Re-employment Agreement (July, 1933) the chief efforts of everyone were devoted to getting employables off the streets and into productive jobs. Weekly hours were reduced, and a generally sincere attempt was made to see that weekly wages did not suffer in the process.

Basically, with an emergency being faced at that time, it was probably fitting that principal consideration should have been given to re-employment. Increases in weekly wages in many cases had to await a return of better business conditions.

Men Kept on Jobs

A glance at figures compiled by the Bureau of Labor Statistics will illustrate the point. Figures published each month in the form of index numbers show that, with the monthly averages for the years 1923, 1924 and 1925 considered as 100, the employment in the machinery industries for the year 1929 was 116.1. Using the same comparison, machinery industry payrolls in 1929 stood at 125.6. Observe that payrolls were relatively *higher* in those boom times than was employment.

In the lowest month of the depression, March 1933, employment in machinery companies had tobogganed to 42.8, while the payroll index dropped still further to 24.0. In other words, employment in that dismal month was twice as great as payrolls seemed to justify according to their 1923-25 relationship. We all remember the answer: wages were drastically reduced, and work was spread as widely (and thinly) as possible, in order to give the maximum number of workers enough in their pay envelopes to buy groceries. It was not pretended that the weekly wage paid in those months of 1932 and early 1933 could do more than purchase the bare necessities.

The same index figures of machinery employment and payrolls for October 1933 show that seven months after the low point had been reached employment had recovered to 62.7 from the March level of 42.8, and that the payroll index concurrently rose from 24.0 to 43.3. The twenty-point spread between the payroll and employment indices remained present in October as it has been in March. To that extent the policy of spreading available wages as well as available work still continued.

It is worth mentioning at this time that employment in all factories tabulated by the Bureau of Labor Statistics kept above the machinery industries' figures for March of 1933 by fourteen points in employment and thirteen points in payrolls. The "all factory" series also had approximately a twenty-point spread between employment and payrolls, which as in the machinery industries, continued into October.

The extent to which re-employment kept ahead of improving payrolls in the machinery industries during 1934 is shown by the index numbers for January 1935. In that month the difference between the two had been reduced only slightly. Payrolls were still behind employment by 18.1 points on the indices. Among builders of power producing machinery, such as engines, turbines, and tractors, the spread was 17.5. In foundries and machine shops payrolls lagged behind employment by 17.4. Among machine tool plants the figure was 16.1. In the textile machinery industry the spread was only 10.7 points, and in railroad repair shops 7.5, while payrolls were only 3.6 points behind employment in the farm equipment industry.

Table I shows the various series of index numbers from which these degrees of payroll lag were calculated. The table likewise discloses the extent to which, during 1935, increasing wages caught up with advancing employment. In the machinery industries as a group payrolls in December were up to 84.9, while the employment index stood only 11.0 points ahead. The discrepancy which had existed since 1932 was rapidly being eliminated. The extent to which this took place in the several machinery industries tabulated can be readily seen.

Still More Progress

During 1936 the situation among the machinery builders has continued to improve. By October of this year payrolls had advanced until the index was only 7.0 points behind the employment figure. The greatest improvement took place among builders of agricultural implements, where payrolls by October

Table I—Employment and Payrolls in the Machinery Industries

Monthly Averages During 1923-25 = 100

1935	All Machinery		Power Generating Equipment*		Foundry and Machine Shop		Machine Tools		Textile Machinery		Railroad Repair Shops		Agricultural Implements	
	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll
Jan.	82.3	64.2	82.6	65.1	71.6	54.2	77.3	61.2	63.6	52.9	49.8	42.3	82.0	78.4
Feb.	84.7	67.8	88.8	71.5	74.5	58.7	81.3	66.4	64.3	53.5	51.0	46.4	84.8	81.2
Mar.	86.8	70.7	94.3	76.7	76.0	60.6	84.2	69.9	64.3	53.2	51.7	47.9	92.7	91.5
Apr.	88.1	71.5	101.3	83.1	76.8	61.1	86.5	71.3	65.3	52.5	51.0	49.0	88.8	87.5
May	87.5	71.8	105.3	88.6	76.3	61.0	87.8	73.7	63.1	52.5	51.7	50.7	88.8	88.9
June	87.1	70.7	106.8	89.1	75.3	59.2	90.0	75.5	63.5	53.2	51.9	49.3	101.2	102.6
July	88.3	71.1	105.0	86.7	75.9	59.7	94.1	79.7	62.9	52.0	51.6	46.6	106.8	108.7
Aug.	89.9	75.1	105.0	88.2	76.5	63.2	97.2	84.6	62.1	51.3	50.9	47.3	107.8	110.6
Sept.	93.6	79.1	105.1	88.8	78.6	65.5	102.0	89.6	62.4	51.2	50.7	47.5	108.4	110.0
Oct.	95.6	82.7	105.2	89.6	79.4	68.0	104.2	94.1	63.8	55.3	53.1	51.3	106.7	109.5
Nov.	96.5	83.0	107.0	90.9	80.3	68.8	105.9	94.8	65.5	55.3	53.7	52.6	113.3	116.6
Dec.	95.9	84.9	109.4	94.3	81.7	72.1	107.4	100.9	67.5	62.1	53.8	55.2	117.9	124.8

Table II—1936 Improvement in Machinery Industries Over 1935

1935 Monthly Averages = 100

1936	All Machinery		Power Generating Equipment*		Foundry and Machine Shop		Machine Tools		Textile Machinery		Railroad Repair Shops		Agricultural Implements	
	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll	Employment	Payroll
Jan.	106.1	110.7	111.0	114.8	106.3	111.8	116.1	124.3	107.7	117.4	104.4	103.4	122.6	129.3
Feb.	106.7	111.8	115.3	119.3	107.6	114.7	117.5	126.5	109.5	119.7	108.4	114.5	124.7	131.7
Mar.	107.8	116.3	117.8	125.4	109.8	120.2	118.6	127.8	110.1	121.7	112.2	124.7	126.9	136.3
Apr.	110.7	122.1	123.3	129.0	112.7	126.6	120.2	127.9	109.6	118.0	111.7	120.0	128.5	137.5
May	113.8	126.7	123.6	129.8	115.8	131.4	122.2	133.5	109.3	120.0	112.2	121.7	126.6	134.5
June	115.2	128.2	123.3	130.1	116.9	133.4	124.7	136.7	109.7	116.0	113.2	123.0	121.3	124.8
July	115.7	124.3	116.7	119.0	118.4	129.7	127.1	135.5	110.2	116.2	110.2	114.7	108.3	104.0
Aug.	116.3	126.0	111.8	115.6	120.2	133.8	122.5	135.0	111.5	120.4	113.1	118.3	95.2	89.5
Sept.	119.7	127.0	110.7	108.2	122.5	135.6	133.2	138.8	113.7	117.6	114.7	121.2	92.7	82.7
Oct.	121.8	137.3	110.2	117.4	124.2	143.4	135.2	153.0	114.5	123.0	117.3	130.8	95.3	100.1

(*) Engines, Turbines, Tractors.

1936 had actually outstripped employment by 5.8 points. Least improvement was shown in the power-generating machinery group, where payrolls remained 12.5 points behind. It will be observed in this latter case, however, that this was more due to a sudden increase in employment than to lack of improvement in the wage situation.

In order to show more vividly the relative rise in payrolls during 1936 there is shown in Table II the 1936 indices of machinery employment and payrolls shifted to a 1935 base. Whereas Table I, it will be remembered, is calculated with the monthly averages for 1923, 1924 and 1925 taken as 100 for each column, in Table II, 100 represents the monthly average of the various series during 1935, and the figures listed for the months of 1936 are the variations from the situations which existed during the twelve months of 1935 and which, when averaged, form "jumping off places" to portray the greater relative improvement in machinery industry payrolls during the present year.

Inasmuch as these indices can be taken as percentages, Table II shows that in all machinery industries on which the figures are collected payrolls had increased 37.3 per cent by October 1936 over their average 1935 amount, and that employment had improved only by 21.8 per cent. This increase is only relative; in October of 1936, on the 1923-25 base, payrolls were only 102.3 and employment was up to 109.3. While almost caught up with employment, payrolls in October of 1936 had still not quite arrived at the situation which existed in 1923-25.

The pay envelope of each worker is growing fatter, however, as can be seen by the relatively greater increase in payrolls over employment in the several machinery industries listed.

That the palmy days of 1929 are not yet returned is obvious, but that the employees' situation in the machinery industries is improving rapidly is clearly shown. It is an interesting speculation to venture guesses as to whether the relatively smaller present rate of increase in employment indicates a growing shortage of skilled labor, or whether the closing of the gap is merely a return to normal conditions. It seems fair in this connection to consider that the demand for men in the machinery industries is approaching previous comfortable levels, since otherwise the rate of improvement in wages would not have shown the indicated tendency to equal the rate of re-employment.

How to Instruct

A few things to remember in instructing the plant worker what to do, says the Foremen's Bulletin published by the American Rolling Mill Company:

If the man hasn't done a job previously, he needs more complete instructions than a more experienced man.

It isn't enough to tell a man what to do. Tell him *why* it is necessary to do it that way.

Be explicit. Go into details. Don't just lead a man up to a job and tell him in general terms to do this particular job.

Know your men. Some are slower to understand than others. If things go wrong because they don't understand, it's your fault, not theirs.

Use simple language and familiar illustrations. If you talk above their heads, they won't understand.

By your attitude, make your men feel free to ask questions. Never high-hat. Be patient, cordial and sincere.

On special jobs of unusual importance, not only tell a man how and why to do a job, but make him repeat to you his understanding of the instructions you have given. This will save many an argument and mistake.

Belt Drive Center Distance

PAUL GRODZINSKI
Berlin Germany

GRAPHICAL methods of finding the distance between centers for pulleys, when a given endless belt is to be used, do not give sufficiently accurate results. By following the method advanced by B. Spector (*AM*—Vol. 79, page 625) an error of 1 in. was secured. Therefore, an approximate mathematical formula has been evolved. An exact formula is not practical because it entails a fourth-power equation, which is not solvable by simple arithmetic.

First, it is necessary to derive the basic formula for the length of an open belt. The whole length is composed of five sections, Fig. 1, and must be multiplied by two. This length is:

$$L = 2\,(l_1 + l_2 + l_3 + l_4 + l_5)$$

wherein

$$l_1 = \frac{\pi}{2} R;\ l_2 = \alpha R;\ l_3 = a \cos \alpha;$$

$$l_4 = \alpha r;\ l_5 = \frac{\pi}{2} r$$

Thus:

$$L = 2\left[\frac{\pi}{2}(R + r) + \alpha (R - r) + a \cos \alpha\right]$$

But $\sin \alpha = \frac{R - r}{a}$, and

$$\cos \alpha = \sqrt{1 - \frac{(R - r)^2}{a}}$$

$$L = 2\left[\frac{\pi}{2}(R + r) + \text{arc sin } \frac{(R - r)}{a}\right.$$

$$\left.(R - r) + a\ \sqrt{1 - \frac{(R - r)^2}{a}}\right] \ldots\ldots (1)$$

This exact formula is not suitable for determining the distance between pulley centers, but substitution of certain approximations simplifies it sufficiently to use for the purpose.

Angle α is of small value even with a high ratio of R/r. Therefore, replace $\sin \alpha$ with arc α. Then:

$$\alpha (R - r) = \frac{(R - r)}{a}(R - r)$$

$$= \frac{(R - r)^2}{a}$$

Also, the root value can be replaced, as $\frac{R - r}{a}$ is always smaller than 1. Thus:

$$a\sqrt{1 - \frac{(R - r)^2}{a}} \simeq a\left[1 - \frac{1}{2}\frac{(R - r)^2}{a^2}\right]$$

$$= a - \frac{(R - r)^2}{2a}$$

The well known formula is obtained by these two substitutions:

$$L_a = 2a + \pi (R + r) + \frac{(R - r)^2}{a} \ldots (2)$$

This approximate equation gives an error of only 0.8 per cent when a ratio $R/r = 10$ is employed, and only 0.35 per cent when $R/r = 5$.

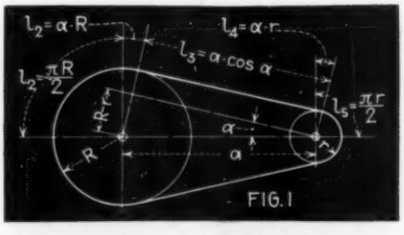


FIG. 1

To use this formula for solving the distance between pulley centers, introduce the following terms:

$$b = \pi (R + r)$$

$$c = \frac{(R - r)^2}{2}$$

Then the equation (2) becomes:

$$L = 2a' + b + \frac{2c}{a'} \ldots\ldots (3)$$

$$a'^2 - \frac{a'}{2}(L - b) + c = 0 \ldots\ldots (4)$$

$$a' = \frac{L - b}{4} \pm \sqrt{\left(\frac{L - b}{4}\right)^2 - c} \ldots\ldots (5)$$

As in general

$c < \left(\frac{L - b}{4}\right)^2$, in this case the root value can also be solved approximately.

$$\sqrt{\frac{(L - b)^2}{4} - c} = \frac{L - b}{4}\sqrt{1 - \frac{16c}{(L - b)^2}}$$

$$\simeq \frac{L - b}{4}\left[1 - \frac{8c}{(L - b)^2}\right]$$

The approximate value of a is therefore:

$$a'_a = \frac{L - b}{2} - \frac{2c}{L - b}$$

$$= \frac{(L - b)^2 - 4c}{2(L - b)}$$

$$= \frac{L}{2} - \frac{\pi}{2}(R + r) - \frac{(R - r)^2}{L - \pi (R + r)} \ldots (6)$$

This latter formula for the distance between centers is exact enough for all general purposes.

An example will show that the exact equation (1) for belt length and the approximate equation (2) will yield comparable results. Assume $R = 16$, $r = 2$, and center distance equals 70. The value of $L = 199.358$ according to equation (1) and $L = 199.348$, according to equation (2).

Can comparable results be secured from the exact equation (5) and the approximate equation (6) for center distance? From (5) the value of $a' = 70.002$, whereas from (6) the value of $a'_a = 70.031$. The difference is so slight that equation (6) can be used under all practical conditions.

M. NASBY
Industrial Division,
The Gates Rubber Company

OUR ENGINEERING department is of the opinion that Mr. Spector's method is too complicated for practical use, and suggests a trial and error method that it finds satisfactory for checking center distance of V-belt drives. First of all, we use the well-known approximate formula (See Fig. 2):

$$L = 2C + 1.57\,(D + d) + \frac{(D - d)^2}{4C}$$

BELT LENGTH COMPARISON

$$L = 2C + 1.57(D+d) + \frac{(D-d)^2}{4C} + \frac{(D-d)^4}{192C^3} + \frac{(D-d)^6}{2304C^5}$$

$$C = \frac{D+d}{2}$$

$\frac{D}{d}$	1	4	9	15.67	1.9	∞ (Limiting)	
D	1	1.6	1.8	1.88	1.9	2.0	
d	1	0.4	0.2	0.12	0.10	0	
D+d	2	2.0	2.0	2.0	2.0	2.0	
D-d	0	1.2	1.6	1.76	1.8	2.0	
2C	2.0	2.0	2.0	2.0	2.0	2.0	
1.57(D+d)	3.14	3.14	3.14	3.14	3.14	3.14	
$\frac{(D-d)^2}{4C}$	0	0.36	0.64	0.78	0.81	1.0	
L CAT.	5.14	5.50	5.78	5.92	5.95	6.14	2.25% Short
$\frac{(D-d)^4}{192C^3}$	0	0.01	0.03	0.05	0.05	0.08	
$\frac{(D-d)^6}{2304C^5}$	0	0	0.01	0.01	0.02	0.03	
	5.14	5.51	5.82	5.98	6.02	6.25	0.48% Short

C = D+d

2a	4.0	4.0	4.0	4.0	4.0	4.0	
1.57(D+d)	3.14	3.14	3.14	3.14	3.14	3.14	
$\frac{(D-d)^2}{4C}$	0	0.18	0.32	0.39	0.40	0.50	
L CAT.	7.14	7.32	7.46	7.53	7.54	7.64	0.13% Short
$\frac{(D-d)^4}{192C^3}$	0.0	0	0	0.01	0.01	0.01	
$\frac{(D-d)^6}{2304C^5}$	0	0	0	0	0	0	
	7.14	7.32	7.46	7.54	7.55	7.65	Exact

The right-hand side of the equation is an infinite series, but we find that it need not be carried beyond the third factor $\frac{(D-d)^2}{4C}$ as the error introduced is smaller than the limits to which machines can be set.

In the table "Belt Length Comparison" we assume as the first condition $C = \frac{D+d}{2}$, which puts the sheaves in contact. Approximate and exact calculations are tabulated for speed ratios from one to infinity. For a speed ratio of 4:1 the belt length is given as 5.50 in., when the first three factors of equation 1 are taken into account. Inclusion of the fourth and fifth factors has a negligible effect because L is increased only to 5.51 in.

The lower half of the tabulation is made for the condition $C = D + d$. In this case the error is zero, according to the number of significant figures after the decimal point.

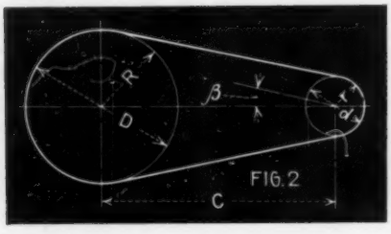


FIG. 2

We make use of the formula simply by listing the factors on a calculation sheet, Fig. 3, and then making provision for a check of the determined belt length against the lengths of standard belts. Of course this is a trial and error method, but it is a quick and easy means of finding the correct center distance for the nearest stock belt.

SHEAVE AND PULLEY DATA

	Drive F Grooved Flat	Drive n Grooved Flat
O. D.		
P. D.	6.0	13.6
R. P. M.		
O. D. for Belt Length		
Face Width		
Arc of Contact		
Factor G		

Belt Length = $2C + 1.57(D+d) + \frac{(D-d)^2}{4C}$

Assumed C	14.5	15.0
2C	29.0	30.0
1.57 (D + d)	30.7	30.7
$\frac{(D-d)^2}{4C}$	1.0	1.0
B. L. required	60.7	61.7
Given B. L. No 60-B	61.7	61.7
Difference	1.0	
½ Diff. for next trial	.5	

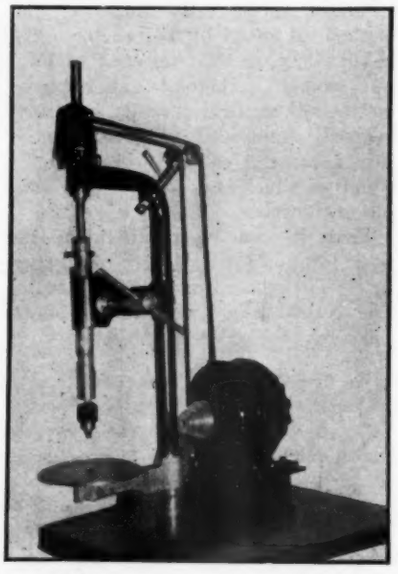
D + d =
D =
d =
D − d =

Industrial Training in Public Schools

H. J. WILLS
Instructor, Jefferson High School, Lafayette, Ind.

Many of us teachers have felt the same as Samuel Gahan (*AM*—Vol. 79, page 884) and have a difficult time convincing shop owners and managers that we are trying to fill their future needs. The pictures published in *American Machinist* will help a great deal proving the value of school training.

In our school shop of only five lathes, shaper, drill press, forge, and one gas welding outfit, we have made many of the same projects. The drill press illustrated was made last year; has speeds of 850 to 4,800 r.p.m., roller bearing idling pulleys, thrust bearing and pulley bearing.



Vermont Apprentices Follow Trade

Eighty-five per cent of the youths graduated from the Springfield, Vt., Cooperative Machine Shop course since 1916 have followed the trade they learned, according to a survey recently completed by John Moore Pierce, director of the course.

Of the 290 graduated, 164, or 60 per cent, are employed in local shops; 53 are employed in non-local shops; and 13 are otherwise employed, but where the training they received is essential to the work being done.

Cooperating firms are the Jones and Lamson Machine Company, the Fellows Gear Shaper Company, and the Bryant Chucking Grinder Company.

Each student spends two weeks at the shop while his alternate is in school; then they exchange positions.

Talking Shop

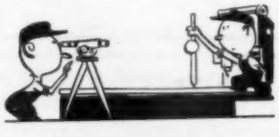
Welding Strips into Sheets

One of the interesting phases of the newer methods of sheet or seam welding is the possibility of building up covering surfaces from comparatively narrow strips of steel. An airplane fuselage, for example, can be closed in by welding 4-in. strips, lengthwise, into a cover for the inner frame work. The advantage is that the strips can be made to conform to the varying contour of the fuselage, whereas sheets must be formed in expensive dies.

While this strip method is not likely to be used for automobile bodies or where quantity production can absorb the cost of dies, it has possibilities for work built in limited quantities. This is particularly true where contours may be changed somewhat to suit different designs. Spotting these surfaces in cases where there is to be no paint or lacquer used, or using a dull finish of any kind, gives a smooth appearance even though the surface may show waves if left bright to reflect the light.

Keeping Planers Level

Really accurate work cannot be done on machines that are out of alignment, particularly if the machines have long beds—planers, for instance. Nor is it enough to know that the machine was set level when it was installed. Fre-

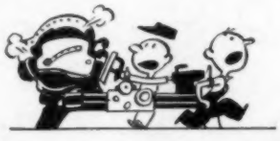


quent checking is necessary to make sure it stayed that way. Rock or concrete foundations may fool you.

This question was brought forcibly to mind during a recent visit to a small shop in the middle west where one planer of well known make is kept for finishing cuts only. The shop is not built on filled ground. Much of the foundation is rock, a condition that might easily lull one into fancied security so far as maintenance of the original setting is concerned. In this shop, however, this planer is checked for alignment once a month. When the error exceeds 0.002 in. the bed is leveled in the usual manner. Sometimes there is almost no variation, then again it may be twice the allowed tolerance. Ground bars and a precision level are used in checking the alignment.

Too Much Heat

A good idea of the increasing care being taken in designing machine tools may be had from a recent conversation with a lathe builder of long standing. This builder, after a long experience with geared head lathes, has



abandoned the practice of using the head as an oil tank. Instead, he has his oil reservoir in the base and pumps lubricant to both bearings and gears.

Exhaustive tests showed that continuous running of the lathe in gear heated the oil to an appreciable degree. This heat expanded the massive head casting sufficiently to raise the spindle from 4 to 6 thousandths above the true center. While this would have no noticeable effect on roughing work, it was enough to make this builder change his design. Which upsets the notion that some seem to have that a lathe is no longer used for finishing work.

Happy Grinders

One way to make a grinder operator happy is to give him a piece of broken boron carbide. He can fasten the carbide piece in a slotted stick and use

it to rough out wheels for contour grinding. The job is accomplished in jig time, leaving only a little finishing to be done with the costly diamond dresser. Boron carbide is that hard, black substance recently developed by certain grinding-wheel makers. At least one of them makes a practice of donating broken pieces to tool cribs.

A Thousandth per Inch

One of the oldest rules of thumb is the allowance of "a thousandth per inch" for force fits and for shrink fits as well. It used to be shaded a bit

on the "heavy" side for small diameters and eased off a trifle as diameters got to be 2 ft. or more. One railroad, however, uses 0.002 in. per inch up to 10 in. diameter and above this limit allows 0.00175 in. per inch. All fits are made with micrometers and the mounting pressures are said to be very uniform. —*The Editors.*

Die Design and Die Making

E. G. MARSHALL
Master Mechanic, Charleston Works, The American Fork & Hoe Company

XVII—Extrusions can be made in various shapes, with either flat or round tops, but the punches for making them require extra sturdy construction

EXTRUSIONS are forced out on on one side or both sides of a part for various reasons. Sometimes they act as spacers for moving parts. In other cases they act as dowels to hold one part in a definite relation to another part. In still other applications they slide over cams and lock. Adding machines are a good example of equipment in which parts with extrusions can be found.

These extrusions do not necessarily have to be round in shape; they can be round, square, round with a flat side, or irregular. Their tops can be either round or square. Accuracy of diameter and height can be held to plus or minus 0.0005 in.

One of the principal differences between an extruding die and a piercing die is that the former has a punch larger in area than the extrusion. If the punch were the same size or smaller, the extrusion would be sheared out instead of being swaged out. This would cause the extrusion to fall out or come loose in service.

A low-production die, shown in Fig. 73, makes an extrusion on an internal gear blank for locating purposes, and also pierces three screw holes. In general construction, this die is similar to an ordinary pierce die, but a base plate *A* has been added to furnish a container for the spring *B* and knockout *C* for the extrusion. In die block *D* the hole for the extrusion is made to the low limit on the part print. Knockout plunger *C* is made a sliding fit in the hole.

Punch *F* makes the extrusion and is of more solid construction than the piercing punches because it is subject to more stress. Its length is shorter as it goes only one-third to one-half way through the stock.

Posts *G* limit the stroke of the extrusion punches more accurately than the stroke of the press would do. They are a drive fit in the punch plate. The other end limits against the die block and is ground to suit in the die tryout. Knockout plunger *C*, extrusion punch *F* and limit posts *G* are made of tool steel and hardened.

Both piercing and extruding are done on a high-production basis in the die shown in Fig. 74. In this case the extrusion lies between two pierced holes, and requires a special ejector. Otherwise, the die is similar to a mounted piercing die. This is particularly true of the upper member which has a stripper, punch plate, pilot pins, bushings and punches. The extruding punch floats the same as the piercers and is bushed in both the stripper and the punch plate.

Die block *A* is made of tool steel and hardened, because the piercing holes are too close together to allow bushings for them. At *B* is a bushing for the extrusion. It is made of drill rod and hardened. Moreover, it is a drive fit in the die block and its hole is made to suit the extrusion. Ejector plunger *C* is a sliding fit in the bushing, and it is made of tool steel and hardened. The lower end of the ejector

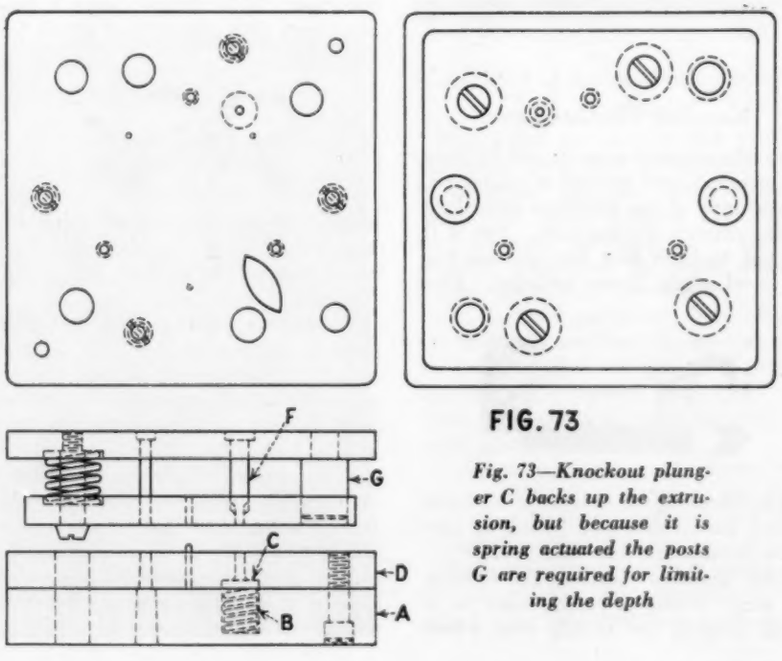


FIG. 73

Fig. 73—Knockout plunger C backs up the extrusion, but because it is spring actuated the posts G are required for limiting the depth

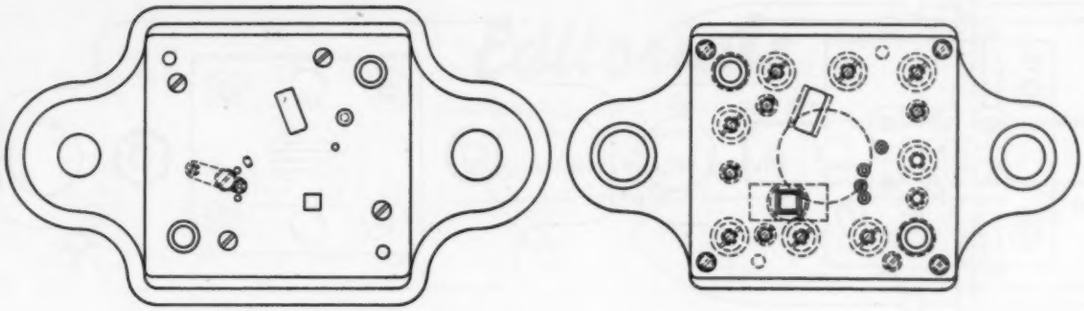


FIG. 74

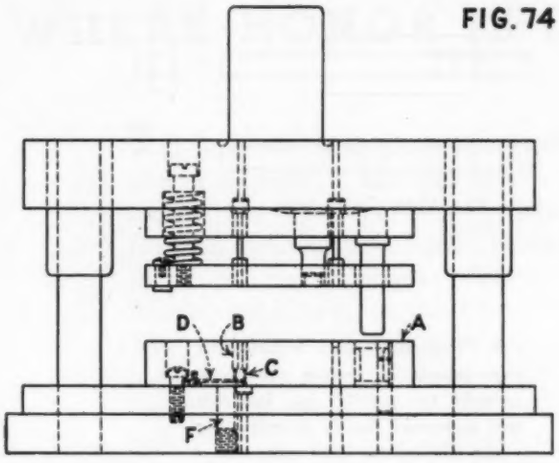


Fig. 74—Flat spring D, assisted by the coil spring E, causes the ejector C to knock out the part

pin bottoms on a hardened plug inserted in the die shoe, in order to give a flat top to the extrusion and to fill it out to a sharp corner. A flat spring *D* mounted in the lower side of the die block causes the plunger to eject the extrusion. Further pressure is given by the coil spring *F* in the die shoe, which acts to boost the pressure of the flat spring. A screw plug supports the coil spring.

In the die shown in Fig. 75, two nubs are extruded on one side and a channel ⅛ in. wide by 3/32 in. deep is swaged on the other side of a flat piece. This part is made of 3/32 by ¼ in. cold rolled steel, and the ends are turned to 3/32 in. in diameter. Endwise location is obtained from the turned shoulder on one end and by a spring at the other end. The piece is located sideways by the turned ends fitting down into grooves.

Five-Piece Die Insert

Die block *A* is made of tool steel, hardened and ground. It is screwed and doweled to the lower member of a purchased standard sub press. The top center portion of the die block is end-milled out to receive the five-piece sectional insert, and one side is milled for the flat spring that locates the part. Two holes, drilled near the center, receive the extrusion back up plungers. In addition, a slot is milled in the bottom to allow travel for the knock-out bar.

Insert *B*, on which the part lies, is made of high-carbon chrome-vanadium tool steel, and hardened and ground. This type of steel is used because of its wear-resisting qualities. This block has holes for the extrusions and the sides are milled down part way to receive the side blocks *C*. The purpose of these two blocks is to prevent the part from swelling beyond a certain width when swaged and extruded. They are screwed to the top of the insert *B* and are backed up by the die block. Chrome-vanadium steel is also selected for these two parts, and they are hardened and ground.

Inserts *D* have a round groove in the center to locate the part and the sides also prevent the part from stretching endwise when swaged. Setscrews are let into these inserts from the top, not for the purpose of clamping the part, but to raise the insert up if necessary, in order to get a finer adjustment and to keep the part

"Die Design and Die Making" to Appear in Book Form

AMERICAN MACHINIST is pleased to announce that E. G. Marshall's current series on "Die Design and Die Making" will shortly appear in book form. The original text and illustrations of the whole eighteen articles plus much supplementary reference material will be published in a single volume by the McGraw-Hill Book Company, Inc., 330 West 42nd St., New York, N. Y. To round out the book for reference purposes, Mr. Marshall has supplied details of miscellaneous dies, a section on shop mathematics of aid to designer and diemaker alike, and notes on steels, heat-treating and grinding

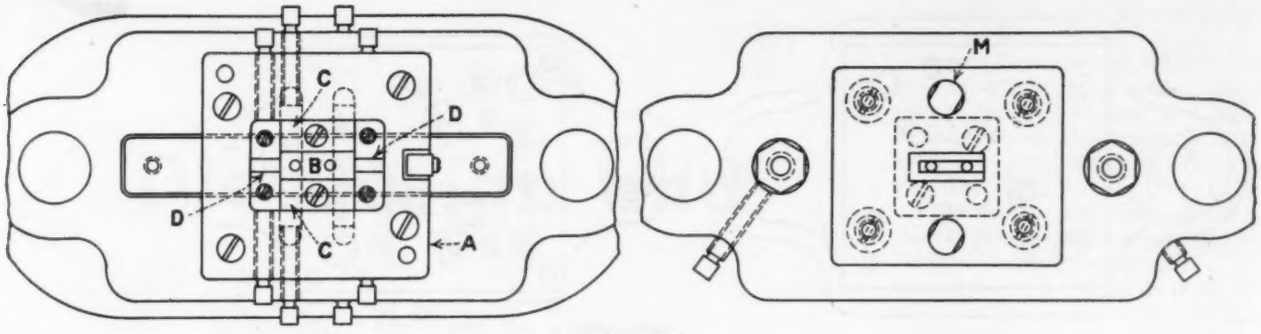


FIG. 75

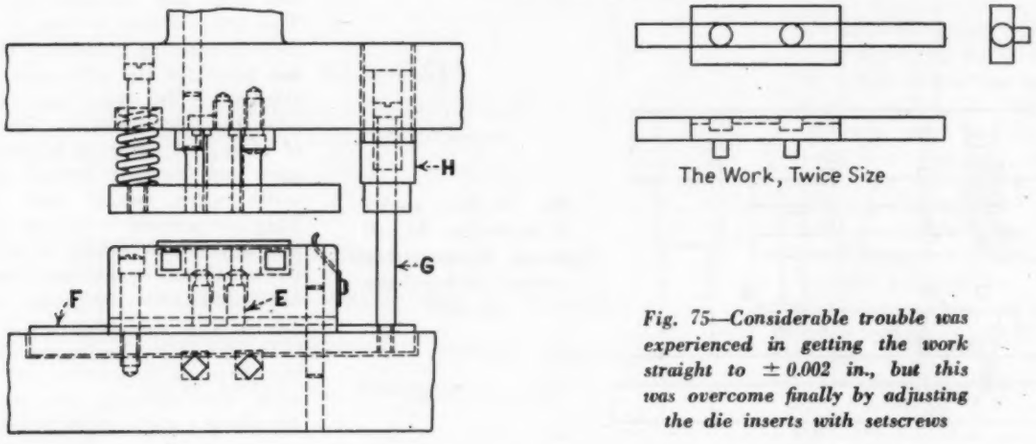


Fig. 75—Considerable trouble was experienced in getting the work straight to ± 0.002 in., but this was overcome finally by adjusting the die inserts with setscrews

straight. Moreover, the die block is tapped for setscrews to move the insert endwise. Thus, the insert is only held in place by the setscrews. Chrome-vanadium steel, hardened and ground, is also use for these two inserts.

Plungers *E* flatten out the extrusions. These plungers, made of tool steel and hardened, are a snug sliding fit in the insert *B* at the top, while the lower ends are a sliding fit in the die block. It will be noticed that the die block is drilled larger part way down to reduce friction. The bottom of the plunger rests on the knockout bar.

Knockout bar *F* is made of tool steel and hardened. Under it are two tapered wedges that are moved endwise to adjust the height of the extrusion. At the ends are two shoulder screws *G* that raise the bar to eject the part. As the upper member comes down the bar rests on the tapered wedges and the heads of the screws *G* move up in the bushings *H*. When the upper member returns to the upper position, the heads of the shoulder screws limit in the bushings and thus raise the bar. The shoulder screws and bushings are made of cold-rolled steel and case hardened. The bushing is threaded into the upper member to get adjustment.

The punch is screwed and doweled to the upper member and is located to suit the inserts in the die block. The bottom end of the punch is shaped to swage the channel in the part, and into it are driven the extruding punches. They have a heel at the top to hold them in and to provide a larger area for backing up the thrust. The extruding ends of these punches extend beyond the swaging punch by the depth they are to enter the metal.

Limit posts *M* are attached to the upper member with fillister - head screws. The lower ends of these posts limit on the die block and during assembly they are ground so that the part is made to correct size. The stripper is made of tool steel hardened and ground, and its function is to hold the part down flat and to strip the part off the extruding punches. It is attached with the usual shoulder screws.

Part XVIII of *Die Design and Die Making* will appear in an early number.

Oversize Taps

STANLEY BALDWIN

In the current series of "Die Design and Die Making," E. G. Marshall recommends (*AM*—Vol. 80, page 257) that all holes in tool steel that is to be hardened should be tapped with a tap 0.003 in. oversize to take care of shrinkage. I am wondering how many shops would furnish taps 0.003 in. oversize today, as Mr. Marshall suggests, when the O. D. tolerance on unground taps is only from 0.001 to 0.0025 inch.

That reminds me that several years ago when working in a toolroom where a great many 5/16-18 in. screws were used in tool steel, a corresponding number of taps were broken on account of the imperfect proportions of that size screw.

I suggested that a supply of No. 18 machine-screw taps having 18 threads be furnished, believing that if the holes were tapped with a tap that was nominally 0.018 in. smaller than U. S. Standard and retapped to size, both operations could be done easily and quickly, thus avoiding the breakage of taps. My suggestion met with the response that the No. 18 taps having 18 threads per in. were special and would be too expensive to supply to the shop.

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 26
K. H. CONDIT • F. H. COLVIN
EDITORS

WHERE HONOR IS DUE

TO Ambrose Swasey's amazing collection of engineering and civic honors and medals the Herbert Hoover Medal, founded by Conrad N. Lauer, past president of the American Society of Mechanical Engineers, has been added. The medal itself is only a bit of metal, but it is rich in symbolism. Herbert Hoover, for whom it is named, made his reputation as a mining engineer teaching us how to extract metals economically from the earth. Ambrose Swasey, to whom it is given, earned the esteem of his fellows by leadership in turning these metals to the advantage of men, a mechanical engineering achievement.

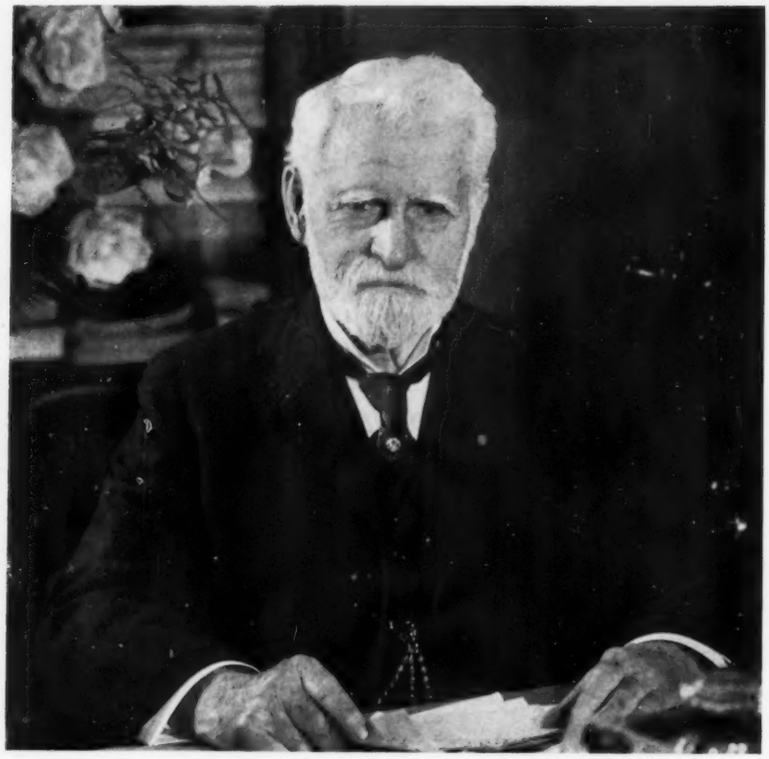
As Gano Dunn, who made the citation, observed, Mr. Hoover's life work led him to the far corners of the earth, Mr. Swasey's confined his activities to the machine shop and tool room. Evidently environment is not the critical factor in engineering achievement, nor in public service, for which this medal is awarded. Both men have given of their best to their profession and to their fellow men. Both are deserving of the highest honors we can bestow.

It is a distinct relief to turn aside for a moment from the distasteful task of "viewing with alarm" the mistakes of economic amateurs, and urging the constructive elements in American life to become more aggressive, that we may comment on an occasion where engineers receive honor and acclaim. Many thoughtless people have accused engineers of responsibility for developments that culminated in the "debacle of the twenties," as Mr. Hoover called the 1929 crash in his brief speech at the engineers' dinner. We hold, on the contrary, that the disaster came not from the contributions to our higher standards of living, for which the engineer is largely responsible, but rather from our failure to pass on to the consumer the savings we made in industry. Our speculative madness got the better of us and brought us to grief.

MR. HOOVER pointed out the duty of the engineer in these words: "The increase of employment under the standard of living depends also on reducing the price of goods to the consumer, and here is where the engineer must range in the area of economics.

"If increased wages and profits are to absorb his savings, which the engineer produces through his labor-saving devices and new methods, and there is not a reduction of prices which is essential to increasing production, thereby we are ourselves by our own neglect producing that mass of technological unemployment. Increasing prices merely because there is rising demand defeats the very end which statesmanship requires in our industries at this time."

The engineer who rises to this responsibility will merit the honor of his fellows, no less than has Mr. Swasey.



Honored—Ambrose Swasey, who will celebrate his 90th birthday on December 19, received the Hoover Gold Medal at the A.S.M.E. dinner

A.S.M.E. Honors Ambrose Swasey, Commemorates George Westinghouse

Annual Meeting reflects keen interest in social and technical programs

NEW YORK — Honors, presentations, dinners, business and technical sessions, and committee meetings crowded the week ended December 5 for those who attended the 57th Annual Meeting of the American Society of Mechanical Engineers. So full was the program that members often had to choose between two or more attractive events scheduled simultaneously.

High point of the week, the annual dinner, held at the Hotel Astor Dec. 2, drew a capacity crowd. On this occasion Ambrose Swasey, founder and chairman of the Warner & Swasey Co., and pioneer in American machine and telescope making, was awarded the Herbert Hoover Medal "to a fellow engineer for distinguished service" as mentioned on the previous page. Mr. Swasey also received the medal of the V.D.I., German engineering organization. The citation was made by Gano Dunn, for the medal board, supplemented by a brief address by former President Herbert Hoover. Dr. Harlow Shapely's Thurston Lecture, "Ninety Years of Stellar Exploration", turned out to be a hilarious account of the astrology of the year of Mr. Swasey's birth.

On Dec. 1, at the Westinghouse 90th Anniversary Commemoration, friends and business associates of the late George Westinghouse paid glowing tribute to the man whose genius played so large a part in developing the air brake, alternating current, the steam turbine and railway electrification. W. L. Batt, retiring A.S.M.E. president, was chairman at the afternoon session during which Charles F. Scott, professor emeritus of electrical engineering, Yale University, extolled his old associate. Dr. Scott, who was engaged with Mr. Westinghouse in his Niagara power development, has been collecting memorabilia concerning his former chief.

W. W. Nichols, assistant to the president, Allis-Chalmers Manufacturing Co., who as engineer of tests of the Chicago, Burlington & Quincy Railroad, ran the first comprehensive tests on air brakes in 1886, described this historic event. He was introduced by Ralph Budd, president of the Burlington. Thomas Campbell, who has been employed in Westinghouse foundries for the past 51 years told of his long friendship with Mr. Westinghouse.

A. W. Berresford, W. N. Storer and L. B. Stillwell, consulting engineers who played an important part in Westinghouse history, spoke of their experiences with him. Frank W. Smith, president, Consolidated Edison Co. and C. R. Beardsley, who were executives of the Brooklyn Edison Co. when that borough changed from d.c. to a.c. current, recalled the part Westinghouse played in that project. Mr. Westinghouse's forward policies in industrial relations were described by John F. Miller, vice-chairman, Westinghouse Air Brake Co.

Dr. Angell Speaks

The commemoration extended into Honors Night. The evening session was addressed by Dr. James R. Angell, president, Yale University, and Paul D. Cravath, attorney. Dr. Angell paid tribute to the achievements and leadership of Mr. Westinghouse and told how his accomplishments affect our modern life. Mr. Cravath, recalling a personal friendship with Mr. Westinghouse which began 50 years ago, dwelt at some length on his financial achievements which did not come to fruition until after his death.

Also honored by the Society were:

George A. Orrok, who received honorable membership for his outstanding contributions to the power field.

Edward Bausch, Bausch & Lomb Optical Co. who was awarded the A.S.M.E. medal for "meritorious mechanical developments in the field of optics."

Charles M. Allen, professor, Worcester Polytechnic Institute, who won the Worcester Reed Memorial Medal for "his continued hydraulic laboratory work and for the permanent value of the papers on his development of methods of testing large hydraulic turbine installations."

H. A. Stevens Howarth, Kingsbury Machine Works, who was awarded the Melville medal for his paper "The Loading and Friction of Thrust and Journal Bearings with Perfect Lubrication."

Harwood F. Mullikin, Jr., who re-

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Editor, American Machinist

S. W. Dudley
Dean of Engineering, Yale University

ceived the Junior Award for his paper "Evaluation of Effective Radiant Heating Surface and Application of the Stefen-Boltzman Law to Heat Absorption in Boiler Furnaces."

Many of the technical papers presented before the sessions applied directly or indirectly to the metal-working field. According to a paper by O. W. Boston and W. W. Gilbert, of the University of Michigan, during the Cutting Metals meeting, all test tools on monel metal failed by cupping on the face and by abrasion on the flank below the cutting edge. Prof. Boston pointed out that this phenomenon is peculiar to this material and occurs whether the tools are cutting dry, with emulsion or with sulphurized mineral oil.

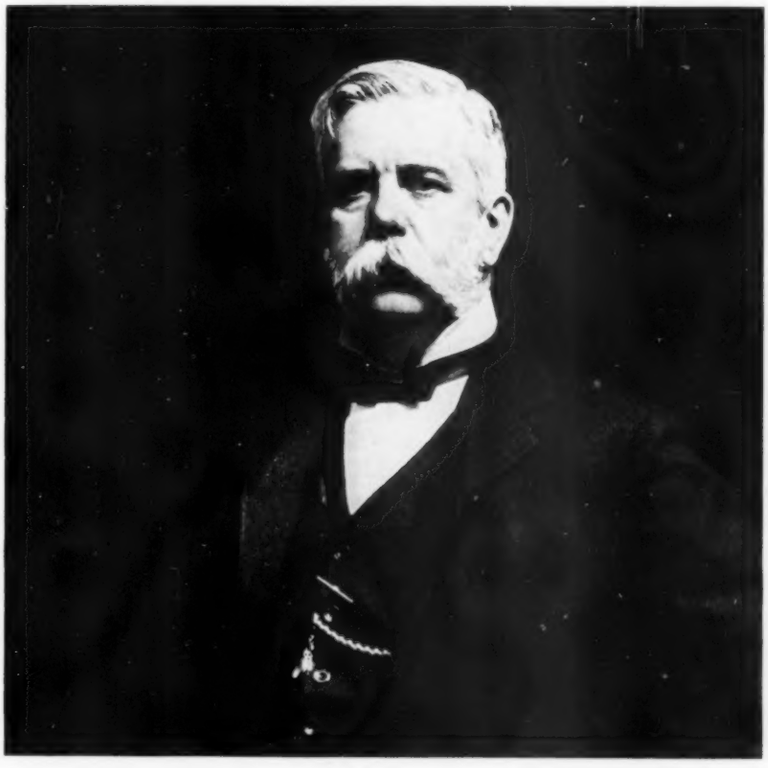
From his investigation on the "Comparative Torque and Horsepower Requirements of Standard Four Flute and Special Flute Taps," Harry L. Daasch, Iowa State College, reported that a tap with a special spiral flute generally required less horsepower than a straight flute tap when used on SAE 1020 steel.

Carboloy Company's improved technique of grinding carbide tools was reviewed by L. J. St. Clair. His talk, following the lines of the article "Carbides Ground in Half the Time" (*AM*—Vol. 80 page 573) included the information that a diamond hone in the hands of the operator for touching up the tool periodically will add many pieces per grind.

Graphic proof that abrupt changes in the direction of motion are fatiguing and expensive was given by Prof. Ralph M. Barnes in his paper "An Investigation of Some Hand Motions" during the management session on Monday night. Using slides and motion pictures, he described a test set-up used at the State University of Iowa for measuring basic hand movements in a horizontal plane. W. R. Coley, Leeds & Northrup Co., showed the value of close cooperation between management and employees in introducing or revising any job analysis and wage payment system. Time study men in his organization have been given courses in motion study and industrial psychology. In his paper "Motion Study as a Basis of Establishing Proper Employee Training and Personal Relations." A. Williams, Jr., Hood Rubber Co., covered primarily the semi-skilled workers because of his claims that the greatest benefit from motion study may be realized in this group. Allan H. Mogensen, consulting editor of *Factory Management and Maintenance*, pointed out that "the one best way" to perform an operation may be achieved by training programs designed to raise the working level of the average operator to a point even with the working level of the best operator.

At the Plant Layout session, held Wednesday afternoon, A. F. Murray, manufacturing engineer, Westinghouse Electric & Mfg. Co. pointed out that plant layout in its broader aspects involves product design, process development, tools and machinery, building construction, operation analysis and sequence, production control, materials handling, storage and supply and industrial relations. At the same session B. C. Koch, International Business Machines Corporation, discussed the use of motion and time study data in determining the solution of plant layout problems. He pointed out that 20 to 80 per cent of the time taken for a manufacturing operation is devoted to handling the part or the tools.

The increasing importance of maintenance as an engineering function was indicated by the large attendance at the maintenance luncheon on Thursday. According to W. O. Larson, mechanical superintendent, duPont Viscoloid Co., preventative maintenance is less expensive than breakdowns. The control system used for accounting



Commemorated — **George Westinghouse's 90th Anniversary was remembered by his friends in a review of his mechanical achievements and personal relationships**

and reporting maintenance costs by North & Judd Mfg. Co. was described by W. C. Zinck. Alfred Voksdal, plant engineer, Corning Glass Co., pointed out that few maintenance engineers operate without any plan at all. Unless it is an emergency, all maintenance work in the mechanical department of the Bristol-Myers Co. is performed according to a planned schedule. John I. Thompson of this concern told how a record is kept of repair hours for each machine.

F. N. Speller, National Tube Co., reviewed the factors involved in corrosion by way of introducing the Corrosion Resistant Metals Symposium. Corrosion resistance of aluminum, rather than its lightness was the quality stressed by E. H. Dix, Jr., and R. B. Mears of the Aluminum Research Laboratories. George O. Hiers, National Lead Co., followed with a talk on the construction of lead-lined equipment for the chemical industries.

In discussing corrosion-resistant steels and irons, J. H. Critchett, Union Carbide and Carbon Research Laboratories, gave some pertinent data on the relation between alloying elements and the ability of these metals to withstand various corrosive media. The nickel and nickel base alloys were covered in a comprehensive paper submitted by F. L. LaQue, development and research divison, International Nickel Co.

Zinc coatings and factors determining their life, as applying especially to the chemical industry, was the topic discussed by E. A. Anderson, research division, N. J. Zinc Co. A further contribution to the subject of chemical equipment was made by H. L. Maxwell, E. I. duPont de Nemours & Co., who talked on the corrosion resistance of cast iron. R. A. Wilkins, the Revere Copper and Brass Co., presented "Copper and Copper-Base Alloys in the Construction of Corrosion Resisting Equipment and Structures."

Prizes and awards are essential to success of any safety program, according to Harold Miner, E. I. duPont de Nemours & Co., who spoke on "Practical Results from Safety Contests," during the Safety Session, Tuesday afternoon. Get the men thinking about unsafe practices and hazardous conditions, and the management will be due for a big surprise in the number of items turned up.

D. L. Royer, of the Ocean Accident & Guarantee Corporation, urged that management see that all operating instructions are adequate, clearly written and enforced. Mr. Royer, and also discussion from the floor, brought out that, if foremen and operators are interested and consulted, much better and more workable operation instructions will result.

W. P. Yant, of the Mine Safety Appliances Co., put responsibility directly on the engineer for conditions leading to personal injuries or occupational disease. He said in his paper "Engineers Part in Industrial Hygiene" that the engineer should give careful study in laying out new plants or in checking over old ones to avoid injuries and toxic conditions.

Chips

WASHINGTON —Reduction of WPA lists meets violent resistance from New York artists and vocal objection from New York mayor . . . Roosevelt sails home after triumphal visit to South American republics . . . Federal Trade Commission accuses automobile companies of misleading advertising in connection with financing rates . . . Security Act enrollment time limit extended 10 days . . . Ickes reports results of survey which indicates that for every man hour of direct labor on construction projects there are 2½ man hours of indirect labor . . . U. S. offers treaties to keep the Americas out of war . . . Supreme Court sustains two state laws prohibiting price cutting on branded products, upholds government stand for cost of construction in figuring capital values . . . Roosevelt planning reemployment drive independent of Berry's conference and other existing agencies, will ask industry for suggestions.

FOREIGN—King Edward solves British constitutional crisis by abdicating the throne . . . Nazis prescribe death penalty for those exporting capital or goods illegally . . . Japan's invitation to democracies to join anti-Red group not taken too seriously . . . French suggest Spanish plebiscite as struggle approaches a stalemate . . . German loan oversubscribed, amount increased . . . Japanese foreign minister resigns as protest against actions of field armies that are embarrassing diplomatic moves and hurting Japan . . . Soviets create new war industries commissariat.

FINANCE—According to one interpretation corporations may be taxed for unreasonably high salary distributions . . . New Treasury bond issue sets record for low interest rate—2½ per cent, is oversubscribed as usual.

INDUSTRY —Midland Steel yields to strikers on piecework issue . . . Labor Board complaint names Carnegie-Illinois Steel . . . Boston Federal court upholds job insurance law . . . List of companies giving one and two weeks' pay bonuses to employees grows rapidly as year draws to a close, recent additions include Independent Pneumatic Tool, J. G. White, Cleveland Graphite, Singer Manufacturing, Fafnir Bearing.

INDICATORS —Steel production rises again and approaches 80 per cent of capacity . . . Electric power output sets new record . . . Business Week's index jumps 3½ points to 82.4.

Greetings — Owen D. Young shakes hands with James H. McGraw at the N.A.M. convention while John W. O'Leary, president, Machinery & Allied Products Institute, and Malcolm Muir, president, McGraw-Hill Publishing Co., look on

N.A.M. Moves to Absorb Idle in Private Enterprise

NEW YORK—Meeting at the Waldorf-Astoria Hotel, December 9-10, the 41st annual convention of the National Association of Manufacturers adopted a conciliatory attitude toward the administration, sought ways to employ more workers in private industry and advocated closer employee relations. C. M. Chester, chairman, General Foods Corporation, and president of the Association, sounded the keynote in a twelve-point program which embodied industry's obligations to the public.

"Our job," he said, "is to absorb all of the unemployed possible—to bend every effort of science and management skill to create still more jobs—and at the same time more of the comforts of life for the American people."

Mr. Chester revealed that employment among N.A.M. member companies was 106 per cent of the 1929 level. He recommended specifically that industry create a "National Depression Study Committee" to eliminate business cycles or make them less severe.

Raymond Moley, editor of *Today*, stated that an attempt will be made toward economic adjustment through joint planning between business and government. He assured his hearers "that it is more important for you to find out what is in the minds of the 27 million people who voted for the President last month, than it is for you to try to read the mind of the President and his administrators from day to day."

A vast expansion of productive activity will be needed to repair the economic damages wrought by the depression according to Dr. Harold G. Moulton, president, the Brookings Institution. He further pointed out that sharp reductions in working hours might serve to bring about a serious labor shortage in carrying out the production program essential to the restoration of satisfactory living standards.

In discussing employee relations, Charles R. Hook, president, American Rolling Mill Co., suggested that individual companies explain the operations of their businesses to their employees and help to solve the problem of providing adequate housing for the lower income groups. He urged employers to reduce their policies to writing as his concern did seventeen years ago.

The N.A.M. annual dinner was addressed by E. T. Weir, chairman, National Steel Corporation, and Lewis H. Brown, president, Johns-Manville Corporation. Mr. Weir expressed a belief that a public state of mind unfavorable to industry had been created. He suggested correcting whatever is wrong with present policies of industry, defending what is right, influencing constructively human conditions surrounding production and keeping the public fully informed of industry's actions.

According to Mr. Brown, the ultimate test of our business system lies in its ability to fill the new wants of America. He said Americans want work, more money, still more leisure, security against unemployment and against poverty in old age, and more and better goods at lower prices.

Speaking of regulatory legislation Arthur Kudner, president Arthur Kudner, Inc., stated that it is more to the point today for business leadership to spend its energies not so much in guessing what such legislation may be and do, as to determine why such legislation is popular with the average man.

The Association adopted a Declaration of Principles for American Industry presented by S. Clay Williams, chairman, Reynolds Tobacco Co., and chairman of the resolutions committee.

High Points in N.A.M. Declaration of Principles

- Industry must continue to improve its employment relations, machines, production methods and distribution so that all the people may get more of the things they want at relatively low prices.
- We oppose any monoply in production, distribution or labor which restricts or stifles competition and which imposes a burden of unfair high prices on the consumer.
- Industry pledges its cooperation with the government in the promotion of economic and social progress.
- We are in favor of creating economic security for each citizen without limitation of his individual opportunities for creating such security for himself.
- We believe in and support the right of labor to seek, secure and retain employment without regard to membership or non-membership in any organization and to bargain without interference or coercion by any one, either collectively or individually.
- We have been, and are, unequivocally opposed to child labor as well as to sweatshops in manufacturing.
- Should arbitrary reduction of working hours limit necessary production, the unavoidable increasing cost will reduce the consumer purchasing power we desire to enlarge.
- No penalty should be imposed upon just financial allocations set aside for emergencies and expansion.
- We believe that such agreements (reciprocal tariffs) should be negotiated with specific countries, with corresponding benefits to both the United States and the foreign country involved, and that such agreements should be ratified by the Senate.

Diesel Power Acclaimed By Industrial Leaders

Fortieth Anniversary of First U. S. Engine Celebrated

Wider use of diesel power, as the herald of a new power age, were forecast last week in railroad operation, highway and sea transportation, agriculture, and aviation at a luncheon at the Hotel Waldorf-Astoria, New York, in honor of the 40th anniversary of the introduction of deisel power in the United States and in memory of the late Rudolf Diesel, who designed the first practical compression-ignition engine.

About 330 leaders in industry and engineering heard members of the diesel committee of the Exposition of Power and Mechanical Engineering, which sponsored the luncheon, praise merits of this type of engine. American manufacture of such horsepower is now twenty-one times that of 1932.

Gordon Rentschler, president of the National City Bank, chairman of the committee, first introduced John B. Kennedy, who declared that the United States had outstripped the world in diesel development.

B. C. Heacock, president of the Caterpillar Tractor Co., producer of diesel engines, said that the 21,418th tractor had been built. This production has taken place in five years.

The new giant of diesel power, growing stronger day by day "is sure to occupy a vast field as a prime mover," said Edward G. Budd, president of the company which manufactured the first Diesel-powered streamline train. C. L. Cummins, president of the Cummins Engine Co., told how he had driven a diesel powered coupe from Los Angeles to New York for a total fuel cost of $7.63.

Other speakers were Edward B. Pollister, president of the Busch-Sulzer Brothers Diesel Engine Co.; Colonel Robert H. Morse, president of Fairbanks-Morse & Co. and Charles F. Kettering, vice-president of the General Motors Corp.

Experts Flay Tax Bill As "Punitive" Measure

Revision of Revenue Act of 1936 Urged at Conference

Dire need of revision of the Revenue Act of 1936 was expressed repeatedly on Dec. 2 and 3, during the conference on taxation and finance held at the Waldorf-Astoria Hotel, New York, under the auspices of the American Management Association. More than 300 tax experts, accountants and attorneys attended the sessions.

Several speakers encouraged taking to the courts disputed claims made on behalf of corporations to clarify numerous points in the law. John F. Evans said, "Whenever a person feels that he is the subject of an oppressive and invalid measure, as many believe this act to be, he ought to be encouraged to challenge it so that our government does not exceed the bounds set by our constitution. The government, in fact, should welcome any enlightenment the courts could give."

Henry I. Harriman Spoke at A. S. A. Annual Dinner

Just returned from conferences abroad, Henry I. Harriman, former president of the Chamber of Commerce of the United States, reviewed the European situation and its application to America's problems at the annual dinner of the American Standards Association, Dec. 9. Dana D. Barnum, president of the Boston Consolidated Gas Company, and re-elected president of A. S. A., reviewed the Association's work for the year and showed that 357 standards have now been approved. Edmund A. Prentis of Spencer, White & Prentis, New York, was re-elected vice-president. F. M. Farmer, vice-president of the Electrical Testing Laboratories, Inc., was elected chairman of the Standards Council, which approves the American standards and specifications advanced by engineering societies.

Industrial Review

• WITH practically no exceptions industrial centers throughout the country report improved business in machine tools and factory equipment. Many distributors report that the month of November was either the best month of the year or else ranked with the first two or three. Lengthening delivery dates and upward revisions of price lists by individual companies have served to stimulate the placing of orders.

• ONE New England distributor describes his business during the first two weeks in December as an avalanche. Buyers are not awaiting for the customary year-end meeting to approve budgets but are placing orders in an effort to get deliveries within a reasonable time. New York reports a continuance of good business and an increasing diversification of sources. In the Philadelphia territory there has been little change in the last two weeks, orders remaining at a fair level. December is likely to be an entirely satisfactory month in the Pittsburgh district according to distributors there. Business in standard machines is patricularly good. There is no serious labor trouble at the moment.

• FROM Cleveland comes word that business continues on the upgrade with deliveries of machinery more of a problem than orders. Labor trouble is not serious at the moment but threatens to be later on. Detroit reports good inquiries for special tools and a substantial volume of orders for standard machines for replacement. There is improvement in the supply and small tool business also. Inquiries are active in Toledo and prospects for the immediate future are considered to be decidedly favorable. December has started out exceedingly well in Cincinnati and is contributing materially to the steadily growing backlog of unfilled orders.

• DECEMBER promises to be a good month in Indianapolis where inquiries and orders are both fairly good. St. Louis reports business inquiry good and no serious labor troubles in sight. In Chicago reports are to the effect that the business situation is very satisfactory. The same word comes from Milwaukee. At the moment the only serious strike is the long drawn out affair in the Case Racine Plant. There are rumors that Nash may move to Detroit.

• WITH the maritime strike of more than 30,000 workers entering its seventh week, Pacific coast industry is feeling its effects in all types of business activity. Although machine tool orders have shown some drop, they have been holding better than severe labor conditions would imply.

Watching Washington

Berry concludes council session with offer to quit . . . Industrial regulation recommended . . . Roper group studies NRA data . . . Many firms accept contracts under Walsh-Healey limitations

WASHINGTON — Unperturbed by momentous events in England nor by the rival industrial meeting held by N.A.M. in New York, Major George L. Berry held his sessions of the Council for Industrial Progress last Thursday and Friday according to schedule. Though competing attractions robbed the Major of some of his headlines, he partially made up for this by going on the air and observed the trend of the week by offering to abdicate. As pointed out by an associate, the Major's proposal was less comparable to the King's than to Mrs. Simpson's offer to withdraw "if such action would solve the problem." The problem, of course, was how to make joint recommendations of industry and labor in the absence of such important industries as the automobile, cotton textile, chemical, steel, anthracite coal, petroleum and machinery.

However, the unbalanced aspect of the council did not deter the Major from carrying through a preannounced program. In closing its two-day session it authorized the appointment of a correlating committee to draft proposed legislation with a lawyers' committee to advise. Keystone of a nine-point plan was a proposal for a fedtral trade practice act which would include maximum hours and minimum wages. Among practices which would be banned is the use of "loss leaders" to promote sales. According to the council's fair trade practice committee's expressed belief, "a large part, if not all, of the important business activities of the country can by proper legislative draftmanship be brought within the jurisdiction of Congress."

Industrial Court Suggested

Administration of such legislation would be handled by a reorganized Federal Trade Commission or a new regulatory body created to approve trade practice agreements submitted by management and labor. Above this the committee suggested placing an industrial court. Also urged by the Council were more RFC loans to small industries and a federal unemployment census to be taken every five years.

Presidential blessing was bestowed on Berry's party in a letter from the White House dated November 16. Well wishing though it was, Roosevelt's missive avoided direct indorsement of the council or its works.

In addition to Presidential and industrial regrets absenteeism was epidemic at the sessions. Asked to address the gathering, Secretary of Commerce Daniel Roper, who has an industrial advisory group of his own, declined. Out of town "resting" was John L. Lewis, chairman of the Committee for Industrial Organization. With A.F. of L. President William Green heading up the council's labor group there is little mystery to Mr. Lewis' disinclination to play a secondary role in Major Berry's well staged show. Miss Frances Perkins on the contrary obliged with an account of what the Labor Department is doing to foster an apprentice-training program.

Paine Would Limit Technology

Chief of the Major's industrial supporters was John G. Paine, chairman of the council's management group. He went so far as to call for control of technological development on same basis as government agencies today have authority to regulate the "smoke nuisance." Mr. Paine also announced that the council now represents 60 per cent of all employment, with the construction, automobile repair and retail tobacco businesses in line. Noticeably omitted from the groups named is any major manufacturing industry.

Meanwhile economic data developed by NRA during its life are being studied and correlated by a committee of government actuaries and business men appointed by Secretary Roper. He will receive the report December 31 and will transmit it to the President who is expected to make it available for distribution.

Opponents of the Walsh-Healey Act regulating working hours on government contracts, who predicted that its effect would be to stifle bidding, find it difficult to explain the stream of new awards being announced by the Labor Department. As of the end of November, 234 separate contracts falling within the Act's limitations had been awarded by Uncle Sam.

Successful bidders, and therefore conformers to the Act, include such big names as General Electric, Westinghouse, Endicott-Johnson, Standard Oil of Indiana, Sinclair, Colgate-Palmolive-Peet, duPont, Atlas Powder, Allis-Chalmers, American Bridge and the Aluminum Co. Apparently these concerns and others are as willing as ever to do business with the government.

Some Not Interested

The other side of the picture, more difficult to obtain, shows that at least two industries have worried purchasing officials by refusal to come under Walsh-Healey restrictions. There are big motor makers and machine tool builders. Outside the fold until recently, marine boiler makers are now said to see the light, and ample boiler bidding is confidently expected in the future.

Truckmakers have not yet been subjected to a real test. When the Resettlement Administration tried to buy 28 they split bids so as to bring offers under the $10,000 deadline; on readvertisement they declined to bid except on one item below $10,000. Subsequent truck purchases have been made through local dealers.

The Navy, principal purchaser of machine tools, is reported to be concerned at the stand of the builders. With private orders already booked well into the future, this industry can afford to sit back and let the government do the worrying.

Main results business can expect from the Army-Navy mobilization plan are smooth transition of industry into wartime production and quick return to prewar level avoiding the evils of over capacity. In general not more than 50 per cent of capacity will be asked of any manufacturer. The wider spread is being accomplished by examining all the nation's facilities for the production of finished goods, raw materials and services.

Motors AND OTHER MATTERS

December car production sets record, to hold through February . . . Chrysler gets started again . . . Labor situation threatens, parts shortage looms . . . Ford buys tools . . . Big presses needed . . . Trucks top '29

BURNHAM FINNEY
Western Editor

DETROIT—The rush of the public to purchase new cars has almost swept the automobile industry off its feet. Dealers are wiring, phoning and writing for cars, and practically every car produced is going immediately into consumers' hands. Although assemblies this month should be 450,000 to 500,000 units, an all-time record for December, no appreciable dent has been made in the volume of unfilled orders. It will take at least through the month of January to stock dealers adequately.

There is not likely to be a repetition of what happened a year ago. Last December output was 418,317 units. In January it eased off to 377,306 units and during February, thanks partly to the coldest weather in years, slumped to 300,874. The industry feels that the present production tempo will not be slowed down next month and probably will hold through February. Car makers are straining not only to build as many vehicles as possible, but to get a comfortable cushion of materials and parts stored against future requirements.

All Builders Busy

The flurry of activity is widespread. General Motors will make around 200,000 units this month. Pontiac, with 26,000 units, is setting an all-time monthly peak. Buick is up to the 30,000 level, while Olds will top 25,000 (having snapped out of its difficulties. Demand for the La Salle and the Cadillac 60 has upped the Cadillac output to 5,700 cars this month. Chevrolet, despite assemblies in excess of 100,000 cars this month still has unfilled orders squal to almost a month's production.

Heading for 7,000 units a day, Ford is up to about 5,800 units. About one-third of its business is said to be on the 60 series, whereas only one-fourth its output is of that job. It will go into January with some 50,000 orders for demonstrators for dealers' salesmen unfilled. Chrysler, having its operations temporarily disrupted by shortage of frames during the Midland Steel Products strike, is back up to full capacity and is striving for as near 125,000 units a month as its divisions can turn out.

Two worrisome factors are at work to keep factory executives from losing their heads in the present orgy of business. One is the rising stocks of used cars and the other the menacing labor situation. The industry entered the new season with larger numbers of tradeins than a year ago; on the other hand, dealers are selling more used cars and more new cars than then and larger tradein stocks seem in order. One troublesome problem is the fact that an unduly high percentage of new car buyers are turning in '36 and '35 models, and those cars, because of their relatively high values, are hard to sell in winter.

Nash May Move

Threatened strikes and pending shortages of materials keep the industry in a labor stew. Chrysler and Hudson are reported running perilously close to a vanishing glass supply because of the Pittsburgh Plate Glass strike. The United Automobile Workers are talking about a general strike in all General Motors plants unless the strike at Fisher Body's Atlanta plant is settled soon. Kelsey-Hayes had a short sitdown strike in its local plant on Thursday. The Aluminum Co.'s local factory, making cylinder heads for Ford, is closed because of a sitdown strike which started December 10. The impression is that one can expect almost anything in the next few months, with the industry harassed by a series of strikes. Getting away from the intolerable conditions at Akron, Goodyear Tire & Rubber has taken a former Kelsey-Hayes plant in Jackson, Mich., to produce tires. The story persists that Nash, sick of Wisconsin's labor mess, is considering removal of its Wisconsin operations to the Hupp factory in Detroit, which has been unoccupied.

Not much equipment buying has been done lately, because car makers are too busy getting production up to full capacity. However, Ford has purchased considerable machine tool, foundry, welding and heat-treating equipment for increased production at the Rouge plant, its expenditures thus far being roughly estimated at one million dollars. Ford is reported toying with the idea of making the small V-eight motor at its Canadian plant as well as at Rouge. If it reaches an affirmative decision, equipment buying will be heavy. Ford of Canada, incidentally, is in the midst of its biggest expansion program since 1923, which includes a new body manufacturing and final assembly plant to cost $3,300,000.

Tooling Programs to Start

Tooling programs for 1938 and for modernization and expansion of production are expected to be launched shortly after January 1. Studebaker is understood to be contemplating machinery purchases which may involve an outlay of $500,000. Big presses, broaching machines and other heavy equipment probably will be the first to be placed for '38, because of the time required to build them. Machinery companies are impressing on the industry the fact that their shops are loaded with orders and that no longer can deliveries be made within four to six weeks after business is awarded. There should be substantial orders for large stamping presses. Fisher Body, for instance, has too many small presses and not enough big ones to handle efficiently the large-sized stampings now specified.

Chrysler is reported in the final stages of testing a diesel-powered truck which probably will be marketed by one of its divisions in the next year. Exhaustive service tests have been made and Chrysler engineers are enthusiastic about the results. On December 18 Chevrolet will dedicate its new commercial body plant at Indianapolis. With a capacity of 2,000 units a day, this plant literally was built around the old plant and then replaced it department by department. 1936 tops even 1929 in commercial car and truck sales for the industry, with even a better year predicted for 1937.

Production Higher, But Per Capita Output Is Off

Conference Board Study Shows Slump In Individual Output

Although actual output in various manufacturing industries has reached or even surpassed the 1929 level, per capita production in general is still approximately 19 per cent below the per capita output of 1929, according to a study comparing per capita production in 1929, 1933, and 1936, just made public by the National Industrial Conference Board.

Comparisons of production figures for the present year with those of 1929, the Board points out, do not show accurately the shortage that must be made up before 1929 standards are reached, unless the growth of population is taken into account. To provide the same amount of goods per capita today as were made available by industry in 1929, total output must exceed that of 1929.

Of eighteen industries studied by the Board, only four had a greater output per capita of population in the first nine months of 1936 than in 1929.

Per capital output in the automobile industry this year was 78 per cent of the 1929 volume.

Locomotive and Car Orders Continue Gains

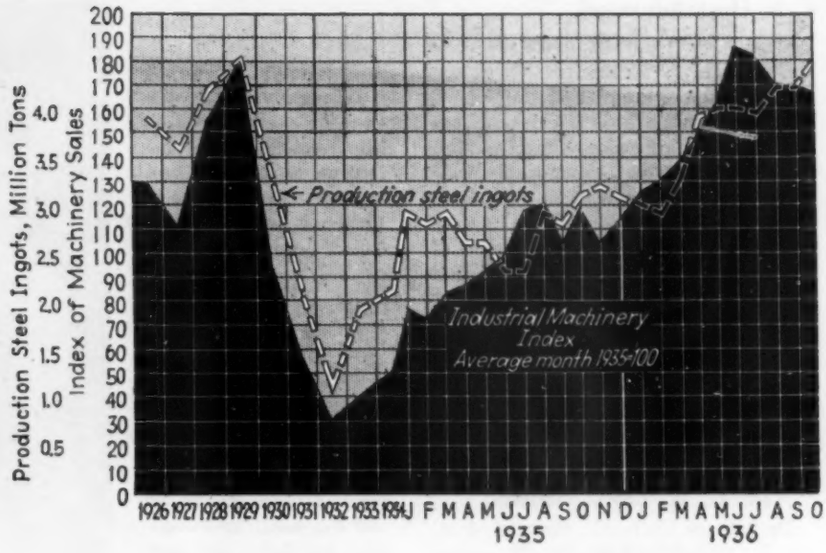
Rail and Equipment Buying Add to Metal-Working Recovery

Railroad equipment buying in the past few months have added another bright factor to the metal-working industries' performance in recovery. Baldwin Locomotive Works, American Locomotive Co. and Lima Locomotive Co. have all participated in the spurt of motive power orders, and the recent order for 27 units from the first named by the Atchison, Topeka & Santa Fe Railway brings the company's backlog to nearly $25,000,000 of unfilled orders.

Rail parts and rails have been bought heavily, steel makers report, largely to take care of the sharp need for replacements postponed during the depression.

November's orders for 1,550 freight cars brought the year's total to 40,214, as compared with 18,699 in 1935. The 1936 total may exceed 1930's, with 46,300.

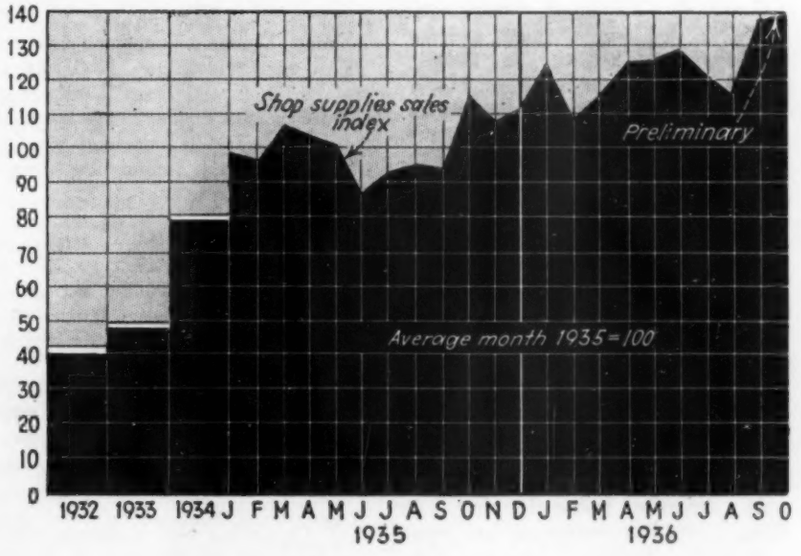
Last month's orders for 50 passenger cars makes a total of 204 passenger-train cars was ordered during the first 11 months of this year more than three times the number ordered in 1935.


Production Steel Ingots, Million Tons
Index of Machinery Sales
Production steel ingots
Industrial Machinery Index
Average month 1935=100
1926 1927 1928 1929 1930 1931 1932 1933 1934 J F M A M J J A S O N D J F M A M J J A S O
1935
1936

Orders for Industrial Machinery

Slow decline of orders since June raises question whether this month saw a major or minor peak. There was a further drop in October of two points in the index to 168. Most of the drop can be traced to smaller orders for electric motors which more than offset the increase in machine tool orders.

Production of steel ingots does not exhibit exactly corresponding fluctuations but the general trend of this curve follows rather closely the trend of the Machinery Index.



Sales of Shop Supplies

Although the index of shop supply sales rose again in October as predicted a month ago, the rate of increase dropped materially. The index stands at 139 for October.

C. E. Hoyt Advanced, D. M. Avey Joins A. F. A.

C. E. Hoyt, for the past eighteen years secretary-treasurer of the American Foundrymen's Association, has been elected executive vice-president, and Dan M. Avey, for two terms president of the Association has been elected secretary-treasurer. Mr. Avey was a vice-president and director of Penton Publishing Co., Cleveland, and since 1926 has been editor of that company's publication, *The Foundry*. Mr. Hoyt continues as the executive officer of the Association, and will direct his efforts toward broadening the field service of the A.F.A.

Dr. G. W. Lewis Honored

Dr. George W. Lewis, director of research, National Advisory Committee for Aeronautics, was presented the Daniel Guggenheim Medal Dec. 4 for "outstanding success in the direction of aeronautical research, and for the development of original equipment and methods," at a dinner given by the Institute of Aeronautical Sciences, Biltmore Hotel, New York.

Major E. E. Aldrin, president of the Guggenheim Medal Fund made the presentation, and Harry F. Guggenheim was toastmaster.

George C. Thomas Was Shoe Machinery Executive

George C. Thomas, 54, Swampscott, Mass., general superintendent and assistant vice-president of the Beverly plant of the United Shoe Machinery Co., died Dec. 3. Mr. Thomas was for a time connected with the Bridgeport (Conn.) plant of the Singer Co.

Charles W. Plumb Dies

Charles W. Plumb, 62, secretary and purchasing agent of the Eagle Lock Co., Terryville, Conn., died Nov. 22. Mr. Plumb has been connected with the Eagle Lock Company all his life.

PERSONALS

AUTOMOTIVE

LEONARD T. DALECKE, assistant resident manager of Fisher Body plant 1, Flint, Mich., has become resident manager of the company's Atlanta, Ga., division.

STEPHEN J. KAISER, master mechanic, Chevrolet Motor division, General Motors Corp., has been appointed master mechanic of Adam Opel, A. G., division of General Motors, Ressels-heim, Germany.

Frederick B. Heitkamp is now in charge of all sales activities of American Type Founders Sales Corp., as general sales manager. Last April he resigned as vice-president of Lyons Metal Products Corp. to join the type foundry and printing machinery concern. For many years he was general sales manager of Cincinnati Milling Machine Co. and Cincinnati Grinders Inc. Widely known for his interest in merchandising, he is a frequent speaker at meetings of sales executives and has made numerous addresses before national associations

FOREST S. BASTER, former chief engineer, automotive division, Lycoming Mfg. Co., Williamsport, Pa., has been appointed assistant engineer of White Motor Co., Cleveland, in charge of engines.

E. J. HUNT, master mechanic, Plymouth Motor division, Chrysler Corp., has been transferred to the central estimating department of the parent company.

RAILROAD

W. DONOHUE, master mechanic, Southern Pacific Lines in Texas and Louisiana, Ennis, Texas, has been appointed superintendent of shops at Algiers, La. He is succeeded by J. E. FRELS, formerly roundhouse foreman at Yoakum, Texas.

F. J. JUMPER, assistant general mechanical engineer, Union Pacific Railroad, has been appointed acting general mechanical engineer, Omaha, Neb., succeeding A. H. FETTERS, retired.

J. S. NETHERWOOD, assistant superintendent of motive power and equipment on the Southern Pacific Lines in Texas and Louisiana, has been transfered to Houston.

T. OLSON has been appointed master mechanic of the Chicago Great Western Railroad, Oelwein, Iowa.

GENERAL INDUSTRIAL

B. C. HEACOCK, president, Caterpillar Tractor Co., Peoria, Ill., has been nominated for president of the Illinois Manufacturers' Association.

JOHN T. BROWN, formerly works manager of Chain Belt Co., Milwaukee, has been elected vice-president of the company. He joined the company as graduate student apprentice in 1925, and has served as production manager.

WILLIAM E. CROCOMBE has been elected vice-president of the American Brake Shoe & Foundry Co., New York. In 1915 he organized the Ajax Forge Co., now the American Forge division of his present company. He was elected president of the division in 1934.

GEORGE C. HOCKENBERGER has been named division manager, Casco Products Corp., Bridgeport, Conn. He was formerly connected with the Trico Products Co., Buffalo, engineering department.

ARTHUR S. HAWKES, formerly senior mechanical engineer, Naval Engineering Experimental station, Annapolis, Md., has joined the Nordberg Mfg. Co., Milwaukee.

JOSEPH KINNEY has been appointed assistant manager of machinery sales, United Engineering & Foundry Co., Pittsburgh.

ERNEST K. VON MERTENS, formerly engineer with Groov-Pin Corp., Long Island City, N. Y., has been appointed general manager of Driv-Lok Co., Inc., Bridgeport, Conn., recently formed to manufacture self-locking machine mechanisms.

CARL F. SCOTT has been appointed assistant to the manager, Bridgeport, Conn., works, General Electric Co., in charge of engineering activities.

ARCH WARNER, for many years production executive with Universal Products Co., Inc., Dearborn, Mich., automotive and parts manufacturer, is now district manager for Bingham Stamping & Tool Co. and Logan Gear Co., for the Detroit territory.

PROF. J. C. HUNSAKER, head of the department of mechanical engineering, Massachusetts Institute of Technology, Cambridge, has been made secretary of the American Organization Committee for the Fifth International Congress of Applied Mechanics, which is scheduled to meet in Cambridge in September, 1938.

TOM BARLOW has been appointed to the division of process metallurgy of the Battelle Memorial Institute, Columbus, Ohio.

On A.S.M.E. Committee

COLEMAN SELLERS, 3rd

COLEMAN SELLERS, 3rd, chief engineer of William Sellers & Co., Philadelphia, has been appointed a member of the Standing Committee on Publications of the American Society of Mechanical Engineers.

K. H. CONDIT, editor, *American Machinist,* has been appointed a member of the executive committee of the Council of the American Society of Mechanical Engineers.

L. C. MORROW, editor of *Factory Management & Maintenance,* and formerly managing editor of *American Machinist,* has been elected chairman of the executive committee of the Management Division, American Society of Mechanical Engineers.

R. PETER FRIIS, formerly with George Scherr & Co., New York, has been appointed sales manager of the Severance Tool Mfg. Co., Saginaw.

JOHN L. YOUNG has been appointed manager of machinery sales, United Engineering & Foundry Co., Pittsburgh.

BEN S. MOFFATT is now in charge of vocational training programs sponsored by Associated Industries, Cleveland, a group of leading metal-working corporations there. He was formerly engineering director of Caterpillar Tractor Co., Peoria, Ill. WARNER SEELY, secretary, Warner & Swasey Co., is chairman of the committee.

PETER BLYTHE MACEWAN, formerly production engineer, General Motors of Canada, Ltd., has joined Ethyl Gasoline Corp., Toronto.

Power Transmission Council Names Officers

A. P. Homer has been re-elected president of the Power Transmission Council, Inc., Boston. Other officers are: G. A. Hanson, vice-president and chief engineer; D. W. McAllen, manager, mill supply sales, SKF Industries, Philadelphia, treasurer; and Miss D. M. Rae, secretary. Directors are C. E. Brinley, president, American Pulley Co., chairman, J. E. Rhoads, J. E. Rhoads & Sons; F. H. Willard, president, Graton & Knight, Mr. Homer; W. H. Fisher, vice-president, P. C. Wood & Sons, W. W. French, sales promotion manager, Dodge Mfg. Co., B. A. Keiley, president, R. & J. Dick Co.; R. M. Pendell, Alexander Bros.; A. F. Townsend, Manhattan Rubber Co., and B. C. Brown, I. G. Williams & Sons.

Among the objects the Council has undertaken for its 1937 program are increased engineering research, testing service for members, pooling basic knowledge and patents, increased advertising and promotion effort, technical advisory service for users of group drives and further development of power transmission clubs of which there are now 50, it was announced December 3 in New York.

J. I. Case Purchases Velie Motor Plant

J. I. Case Co. has purchased the Velie Motor Co. plant at Moline, Ill., and is opening its Dixon, Ill. property in an effort to overcome labor difficulties, which have kept its Racine, Wis. plant closed for over a month. The Velie plant is rented now and Case is asking for occupancy Jan. 1.

Anti-union Case workers plan to move to Moline and Dixon, should the company decide to transfer operations from Racine. Many of these men have opposed the strike since its inception in October.

The Dixon property was closed several years ago when its functions were combined with those of the company's Rockford, Ill., works, formerly the Emmerson, Brantingham shops.

The Rockford property has not been affected and sales of lines manufactured there have been unimpeded. Stocks on hand are low.

Air-Conditioning Sales Up

Orders booked for air conditioning systems and equipment in October totaled $4,172,028, compared with $3,351,999 in September, the Department of Commerce estimated on the basis of statistics from 98 manufacturers. No comparable figures are available for October, 1935.

EXPORT OPPORTUNITIES

Tools, portable, electric. (Agency.) Johannesburg, South Africa. *2026.

Stokers, automatic, thermostatically controlled. (Purchase.) Bristol, England. *2022.

Cellulose wadding manufacturing machinery. (Purchase.) Johannesburg, South Africa. *2024.

Cork, bottle stopper, manufacturing machinery. (Purchase.) Roudnice, Czechoslovakia. *2020.

Machinery, motors and heating appliances. (Agency.) London, England. *1954.

Abrasive circles for woodworking. (Purchase or agency.) Paris, France. *1962.

Abrasives, builders' tools. (Purchase.) Port au Prince, Haiti. *1964.

Fruit canning machinery and equipment. (Purchase.) Bombay, India. *1980.

Machinery, accessories and equipment for sugar mills, distilleries and breweries. (Agency.) Brussels, Belgium. *1975.

Machine tools. (Agency.) Bandoeng, Java. *1982.

Automatic and heavy machine tools. (Agency.) Westminster, England. *1979.

Paper goods, bag manufacturing machinery. (Agency.) Paris, France. *1977.

Screw - cutting lathes, bench. (Agency.) Montreal, Canada. *1976.

Textile machinery. (Agency.) Bogota, Colombia. *1978.

* Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

BUSINESS ITEMS

American Shear Knife Co., Homestead, Pa., has moved its Detroit office to the Stephenson Bldg., with Frank C. Moyer in charge.

Baker Industrial Truck division, Baker-Raulang Co., Cleveland, has appointed A. J. Gates, formerly a vice-president, sales representative for the Ohio territory, with offices in the Leader Bldg., Cleveland.

H. Boker & Co., New York, has acquired all rights to Kinite alloy die steel.

Chapman Transmission Corp., Buffalo, maker of anti-friction bearings and mountings, has appointed George P. Dempler Co., 3318 Latonia Ave., Pittsburgh, its representative in that territory.

Detroit Tool & Mfg. Co. has moved its plant and office to larger quarters at 1660 Beard Ave., Detroit.

Metal & Thermit Corp., 120 Broadway, New York, has appointed D. L. Mathias as research engineer in charge of electrode development. He has patented a number of types of welding electrodes and processes.

Rahn-Larmon Co., Cincinnati, has appointed Machinery & Tools Sales, Inc., New Center Bldg., Detroit, exclusive agent for its engine, extension bed and removable block gap lathes in the Detroit territory.

Rivet Cutting Gun Co. has moved its offices and plant to 309 West Third St., Cincinnati.

Rotor Air Tool Co., has moved to larger quarters at 17325 Euclid Ave., Cleveland.

Shafer Bearing Corp. has moved its general offices to the Pure Oil Bldg., Chicago. The company has established a Chicago district office at 545 West Washington Blvd., with a complete stock of its line.

Stearns Magnetic Mfg. Co., Milwaukee, magnetic clutch, brake and separator manufacturer, has appointed S. O. Otrich Co., 119 New Montgomery St., San Francisco, its sales representative in that area.

Super Tool Co., Detroit carbide metals and tool manufacturer has moved its Chicago office to 656 Washington Blvd. Harry Beck has been appointed district sales manager.

Marr-Galbreath Machinery Co., 55 Water St., Pittsburgh, has added PAUL J. GALBREATH to its organization. A recent graduate from Carnegie Institute of Technology, he is the son of M. D. GALBREATH, treasurer of the machinery company.

Exports of Machinery During October, 1936

	October 1936	September 1936	October 1935
Electrical machinery and apparatus	$8,818,945	$7,969,528	$7,256,235
Power generating machinery (except automotive and electric)	837,195	513,762	911,585
Construction and conveying machinery	1,636,385	1,276,676	682,855
Mining, well and pumping machinery	3,343,102	2,683,478	2,430,059
Power-driven, metal-working machinery	3,883,006	3,276,152	2,624,958
Other metal-working machinery	290,633	229,773	324,544
Textile machinery	1,569,452	725,182	862,542

Exports of Metal-Working Machinery During October, 1936

	October 1936	September 1936	Octobe 1935
Engine lathes	$129,749	$113,794	$124,049
Turret lathes	224,707	208,246	105,906
Other lathes	183,983	90,402	72,221
Vertical boring mills and chucking machines	384,243	199,623	69,222
Thread cutting and automatic screw machines	323,599	165,861	236,116
Knee and column type milling machines	99,882	106,849	81,271
Other milling machines	222,407	273,624	205,389
Gear cutting machines	245,177	343,739	128,110
Vertical drilling machines	71,969	15,656	7,512
Radial drilling machines	41,742	10,565	6,700
Other drilling machines	112,792	113,602	102,382
Planers and shapers	54,687	30,648	33,354
Surface grinding machines	85,514	75,321	133,509
External cylindrical grinding machines	104,143	16,590	107,606
Internal grinding machines	47,294	124,567	164,878
Tool grinding, cutter grinding, and universal grinding machines	109,835	130,369	75,491
Other metal grinding machines	126,901	176,875	61,705
Sheet and plate metal working machines	328,031	227 059	115,357
Forging machinery	127,036	11,052	68,604
Rolling mill machinery	192,978	353,802	283,487
Foundry and molding equipment	95,621	38,658	112,303
Other power-driven metal-working machinery and parts	570,716	449,250	329,786
Other Metal-Working Machinery			
Pneumatic portable tools	84,619	72,142	69,000
Other portable and hand and foot operated metal working machines and parts	76,014	80,197	46,283
Chucks for machine tools	21,030	18,859	20,310
Milling cutters, machine operated threading dies and taps and similar machine-operated metal cutting tools	53,123	28,666	153,050
Other metal-working machine tools	55,847	29,909	35,901

OBITUARIES

WALTER AYER, 66, formerly president of Fuller & Johnson Co., Madison, Wis., engine manufacturer, Nov. 18.

CHARLES J. B. BORGESON, 68, head of the Borgeson Tool Co., Syracuse, N. Y., died Nov. 30. He came to this country 44 years ago.

ALFRED F. COOKE, president of the Fawcus Machine Co. and Schaffer Poidometer Co., died Nov. 27. He was president of the American Gear Manufacturers Association in 1928 and 1929.

LEVIN FAUST, 73, a founder of Mechanics Universal Joint Co., Rockford Drop Forge Co., Forging & Stampings Inc., Rockford Machine Tool Co., Sundstrand Adding Machine Co., and Sundstrand Machine Tool Co., Nov. 18.

OTHMAR I. LARSEN, 53, assistant to the president of Borg-Warner Corp., Chicago, and formerly president of Marvel-Schebler division of the company, died Nov. 23.

FRANK P. MCKIBBEN, 65, former president of the American Welding Society, died Nov. 27. He taught engineering in Massachusetts Institute of Technology, Lehigh University and Union College, Schenectady, N. Y., was former city engineer of that municipality and a consulting engineer of General Electric Co.

WILLIAM N. RUMELY, 78, formerly president of H. Rumely Co., LaPort, Ind., farm machinery manufacturer, died Nov. 25.

ALBERT W. STRONG, president, Strong-Scott Mfg. Co., flour mill machinery manufacturer, Minneapolis, Nov. 25.

MEETINGS

AMERICAN ROAD BUILDERS ASSOC. Highway equipment exhibit. Jan. 11–15. Exhibit Hall, New Orleans. C. M. UPHAM, 952 National Press Building, Washington, D. C.

CANNING MACHINERY & SUPPLIES ASSOC. Chicago, Ill. Jan. 25–29. F. E. GORRELL, 1739 H St., N. W., Washington, D. C.

NATIONAL MOTOR BOAT SHOW. Grand Central Palace, New York, Jan. 8–16. IRA HAND, show manager, 420 Lexington Ave., New York.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. Annual Meeting, Jan. 11-15, Book-Cadillac Hotel, Detroit. John A. C. Warner, secretary and general manager, 29 West 39th Street, New York.

American Machinist REFERENCE BOOK SHEET ©

Protective Value of Platings on Steel

Extensive exposure tests, while not absolute criteria, offer a means of predicting the value of various plating materials and the required thickness

Nickel, chromium, zinc and cadmium are common materials plated on steel for protective purposes. Accelerated methods of testing these coatings are not always a true indicator of their relative value, whereas exposure tests under varied conditions take time and are expensive. Thus, the exposure tests made on these four plating materials by the National Bureau of Standards should prove of interest when specifying the plating to be used and its thickness. They were reported in Research paper RP 712 dealing with protective value of nickel and chromium, and in RP 867 on zinc and cadmium.

Specimens were exposed for two years at Key West, Florida, to represent a tropical marine exposure; at New York to represent an industrial urban atmosphere; Pittsburgh for severe industrial atmosphere; Sandy Hook, N. J., for northern marine exposure; State College, Pa. for uncontaminated rural atmosphere, and Washington, D. C. for typical surban atmosphere.

The most important question in the practical application of results of the exposure tests is whether they represent fairly the conditions to which articles in service are actually subjected. This question cannot be answered exactly, but plated metals are subjected to three general classes of atmospheric exposure: (*a*) indoors, where temperature and humidity do not vary greatly; (*b*) continuous outdoor exposure without cleaning such as on pole-line hardware, and (*c*) intermittent outdoor exposure which is usually accompanied by occasional cleaning operations, illustrated by the bright plating on automobiles.

It is probably fair to assume that any plating coatings that will furnish protection for a year or more outdoors in a non-corrosive atmosphere, will last almost indefinitely under normal household or office conditions. For class (*b*) for which zinc and cadmium are most commonly used, exposure tests that involve no cleaning represent actual conditions of service. For class (*c*) it is most difficult to correlate the exposure test with service conditions.

The method of rating the specimens was to express the quality on a percentage basis, which, as shown in the table, is not proportional to the percentage of unrusted surface. In other words, the quality score is not linear with respect to the proportion of rust, but is roughly logarithmic. This is an expression of the fact that a very small proportion of rust may indicate both in protection and appearance a relatively unsatisfactory coating.

Rating of Specimens

Surface rusted Per Cent	*Rating*	*Corresponding Percentage Score*	*Surface unrusted Per Cent*
0 to 0.....	5	100	100
5 to 5.....	4	80	95 to 100
5 to 10.....	3	60	90 to 90
10 to 20.....	2	40	80 to 95
20 to 50.....	1	20	50 to 80
50 to 100.....	0	0	0 to 50

Conclusions of the investigators with respect to nickel and chromium plating are as follows:

1. The protective value of nickel coatings depends almost entirely on their thickness. At least 0.0005 in. is required for good protection under mild conditions, and at least 0.001 in. for severe conditions.

2. The conditions of nickel deposition and of the cleaning and pickling have no marked effects on the protective value.

3. The presence of a layer of copper reduces the protective value of thin nickel deposits under all conditions, and of thick deposits under severe conditions. If chromium is also present, the copper has very little harmful effect in thick deposits. If the copper layer is buffed, the protective value of the composite coating is increased.

4. A very thin deposit of chromium, such as 0.00001 in., sometimes reduces the protective value, especially of pure nickel deposits. Chromium coatings about 0.00002 to 0.00003 in. add very little to the protective value, but maintain their bright appearance owing to their resistance to tarnish. Relatively thick chromium coatings, from 0.00005 to 0.0001 in. improve the protection against corrosion, especially in an industrial atmosphere.

5. The protective value of chromium over nickel or composite coatings is somewhat improved by using a bath with a high ratio, $\frac{g/l\,CrO_3}{g/l\,SO_4}$, such as 200. Deposits produced at 95 F. are slightly superior to those made at somewhat higher temperatures.

6. The use of zinc under nickel makes the protective value less than that of either metal alone. Cadmium has very little effect under nickel.

7. The use of zinc or cadmium under nickel tends to produce white stains and blisters.

For zinc and cadmium coatings their conclusions are as follows:

1. Thin coatings of either zinc or cadmium furnish better protection against corrosion of steel in most normal climates than do equally thin coatings of nickel or chromium.

2. In uncontaminated marine or rural atmospheres either zinc or cadmium coatings with a minimum thickness of 0.0005 in. furnish protection against corrosion for a few years.

3. In industrial locations both zinc and cadmium coatings fail in a comparatively short time.

4. In an industrial atmosphere cadmium coatings fail in from 67 to 75 per cent of the time that is required for failure of zinc coatings of the same thickness.

5. In an industrial atmosphere alloy deposits that contain about 10 per cent of cadmium and 90 per cent of zinc have a slightly longer life than zinc and considerably longer than cadmium.

6. In industrial locations the protective value of either zinc or cadmium coatings is practically proportional to their thickness.

7. Neither the methods used for preparing the steel nor the variations made in the composition of the zinc- or cadmium-plating solutions had any effect on the protective value of the coating that was comparable with the effect of thickness.

8. Plated zinc coatings furnish about the same protection as hot-dipped zinc coatings of the same thickness.

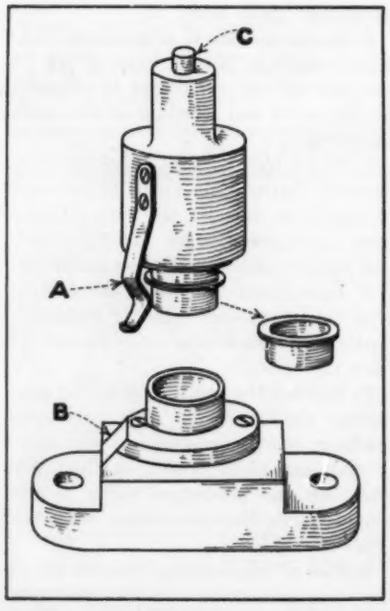
Ideas FROM PRACTICAL MEN

Spring Kickoff for Drawing Punch

C. H. WILLEY
Superintendent of Manufacturing, Hoyt Electrical Instrument Works

The simple kickoff illustrated can be applied to many types of press tools used for small parts. It is just a little clip of 3/64-in. spring brass attached to the punch holder, as at *A*. As the ram descends, the toe of the kick off rides on the taper *B* on the die-shoe, and is pushed out of the way of the tools and the work.

As the ram ascends, the work adheres to the punch. The toe of the kickoff, released from the taper on the die-shoe, contacts the work under tension. As the ram nears the top of the stroke, the work is stripped from the punch by the pin knockout *C*. Just as the work leaves the punch, the pressure of the kickoff flips the piece so that it falls into a receptacle.

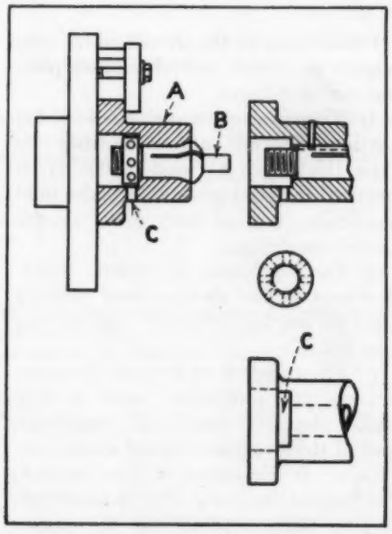


When knockout-pin C strips the cup, spring clip A snaps it into a receptacle

Collet Holder for the Bench Lathe

GEORGE J. MURDOCK
Murdock Research Laboratory

Spring collets, however perfectly made and inspected, will seldom hold work true in the nose of a bench lathe spindle that has become worn. Besides these useful adjuncts for a lathe often receive hard treatment that does not contribute to the maintenance of such accuracy as they may have had when new. Then too, unlike the universal chuck, they are limited to such classes of work as require true axial alignment, and thus are unfitted for use in turning or grinding off-sets such as small eccentrics, cranks or other similar work.



To tighten work a pin is inserted in the slot C of the holder

By the use of the holder shown, however, the usefulness of the spring chuck as well as its capability to do accurate work is much extended. It consists of a housing *A* that is held on the faceplate of the bench or other lathe by the usual straps. After it has been roughly centered a plug gage *B* is inserted in the collet, and the base of the housing tapped until the indicator shows it is running true. The plug is then removed, and the work substituted in its place for turning or grinding. The required operations may be performed with the assurance that if it is necessary to remove the piece it may be again returned and will run true.

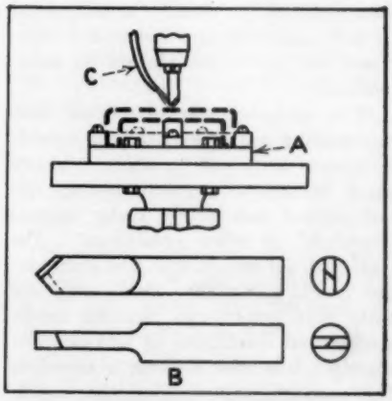
For turning offsets the same method is followed until the plug runs true, and the straps have been tightened. To secure the correct offset a parallel must be clamped on the faceplate the right distance away from the housing, and then the housing moved over. This distance is set with a gage block of the right dimensions. The foot of the housing is then moved over against the parallel and again secured with straps.

After turning has been accomplished, the piece can be removed for hardening and then returned for grinding with the certainty that the finished job will be correct. This holder is also useful for holding chucks correctly for doing work on the surface grinder, miller, or clamped to a faceplate on the dividing head of these machines.

Holes in Clay Ware

EARL PAGETT

A manufacturer of clay ware received an order for several hundred pieces of standard shape. The pieces were in stock, but the order called for an extra nail or screw hole. To make new pieces with the extra holes would



A stream of water under pressure kept the drill cool and washed away the chips

delay filling the order for several weeks, so the work was brought to us to have the extra holes drilled.

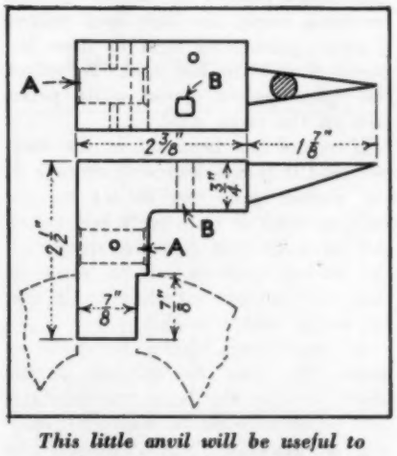
Two drill presses were assigned to the job and a wooden fixture, as at *A* was made for each. The work needed no clamping, a slight pressure of the operator's hand being sufficient to hold it. The fixtures supported the work directly under the drills. Since ordinary twist drills were not thought to be equal to the task, we made drills from both Stellite and Stoodite welding rod, shaped as at *B*, the flat part being somewhat longer than the thickness of the work. Grinding the drills slightly off center seemed to help some.

The feed was by hand lever and required considerable pressure so as to make a sort of crushing cut, the cutting edges of the drills lasting longer than with a light feed. A stream of water under pressure was kept on the drill through the tube *C*, both to cool the drill and to wash away the chips. A man was constantly employed in grinding drills for both operators. The drill presses were run at the slowest speed on the open cones. Some pieces were broken in drilling, but the job was completed in less time than had been expected, since the holes were drilled at the rate of fifteen per minute by the two operators.

Anvil for the Bench Vise

H. L. WHEELER

The small anvil illustrated is intended to be held in the bench vise. It may also be attached to an angle



This little anvil will be useful to mechanics engaged in experimental work

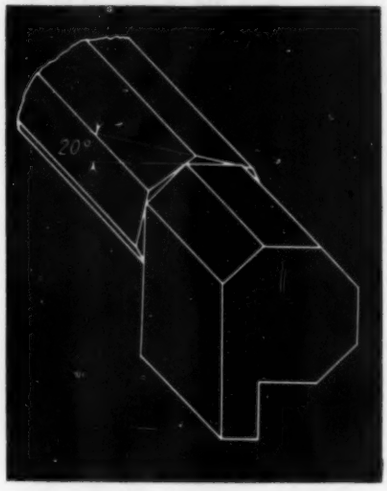
plate by a bolt, or to the bench itself by a lagscrew through the hole *A*. It is made of tool steel, hardened all over and is ground on the face.

It has a small horn and is provided with a ¼-in. square hole for insertion of a bending post, a small hardy, fuller or other tool. Mechanics engaged in experimental work will find the anvil to be a useful addition to the tool kit.

How Two Flats Were Made to Coincide

J. E. MOORE

A student was making a new breech block for an old rifle barrel, with the butt end of the barrel being threaded internally, 16 threads per inch. After



After 0.0035 in. was faced off the breech block, the flats on barrel and block were found to coincide

the block was complete except for the threaded portion, it was chucked in the lathe and threaded. However, when the barrel was brought up tight against the face of the block, the flats lacked 20 deg. of coinciding. His problem was now to find the exact amount to face the block in order to align the flats.

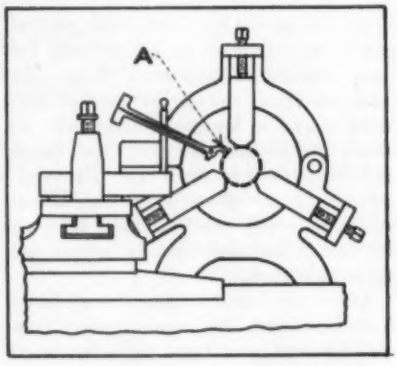
The problem was solved in this way: The fraction of a revolution to bring the flats into coincidence was determined by dividing 20 deg. by 360 deg., or 1/18 rev. The distance the barrel travels in this fraction of a revolution was found by multiplying it by pitch. Thus 1/18 times $\frac{1}{16}$ in. is equal to 0.0035 in. When this amount was faced off the block, the barrel jammed tight in perfect alignment.

Indicator Set-Up for Work in Steadyrest

PETER L. BUDWITZ

In holding long and slender work in the steadyrest, many lathe hands rely upon feel and sight in adjusting the jaws to bring the work into axial alignment with the spindle. Such practice is uncertain and sometimes results in springing the work or throwing it out of alignment with the spindle.

In the illustration is shown how an indicator can be used in aligning the work correctly. The steadyrest jaws are slacked off and the work is placed on centers. Then the indicator is set as shown, the contact point touching the work at an angle of about 45 deg., as at *A*. Then the jaws are brought lightly into contact with the work. While setting the jaws sufficiently tight to hold the work properly, any horizontal or vertical spring of the work will readily be detected by the indicator. Thus for correct setting, the indicator reading should



Any horizontal or vertical deflection of the work from adjusting steadyrest jaws will be detected by the indicator

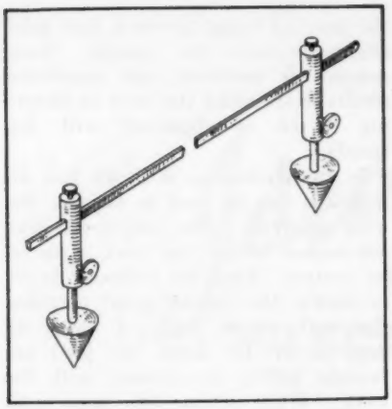
be the same both before and after the jaws have been tightened. If the reading is not the same, the jaws should be adjusted until it is.

Tool for Transferring Center Distances

JOHN E. HYLER
R. G. Le Tourneau, Inc.

Finding the center distances of holes in work being developed so that they may be accurately transferred to the drawing board is somewhat difficult. The distance can be measured with a fair degree of accuracy, if and when both holes are of the same diameter, by measuring from the near side of one hole to the far side of the other. Where the holes are of different diameters, certain calculations that increase the chance for errors are involved. And further, errors may be increased, since the measurement must first be made at the work, and again on the drawing board.

The device illustrated is of the



Center distances of holes of the same or different diameters, or at different levels from each other, can be accurately transferred from the work to a drawing by this tool

beam-compass type and has conical points so mounted as to provide for their vertical adjustment. Thus, the point entering the larger one of two holes may be lowered sufficiently to retain parallelism between the beam and the surface of the work. The conical points are allowed to seat themselves naturally while loosely held on the beam and the binding screws are then tightened.

After the device has been lifted from the work, the conical point that was lowered may then be raised until both points are equidistant from the beam. If the points on the cones are kept sharp and in good condition, the tool can be used to make tiny but well-defined indentations in the drawing paper that will represent the center distance of the holes.

Kinks Did It—Why?

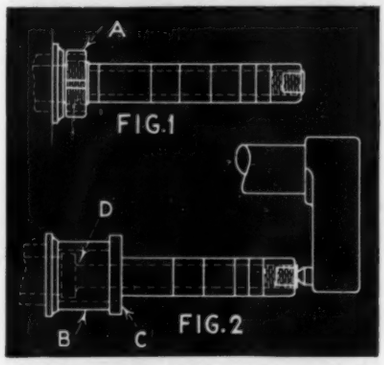
HERBERT M. DARLING
Superintendent, Wells Tool Company

Referring to the article by George J. Murdock under the above title (*AM*—Vol. 80, page 893), I am at a loss to explain why the kinked rod was successful in removing the stuck arbor, more especially so when I look at the size of the hammer shown in the operator's hand in the illustration.

In our shop, we think a piece of tool steel or some good, stiff alloy steel makes a better ramrod than cold-rolled stock. But I do not like to drive out an arbor with a ramrod. Arbors should be made as shown in Fig. 1, with a nut at *A* to be tightened against the spindle nose.

Unfortunately, there are many plain arbors that occasionally become stuck, and we think the best way to remove them is as shown in Fig. 2. Hunt up a sleeve and a heavy washer or a gear blank among the scrap and place them as shown. The sleeve *B* should be larger than the collar at the shoulder of the arbor and the washer or gear blank *C* should be a free fit on the body of the arbor. Replace the collars on the arbor and tighten the binding nut. This will force sleeve *B* against the spindle nose and will loosen the most obstinate arbor without injury.

To prevent undue deflection of the arbor caused by using a long wrench on the nut, it is well to insert the center support on the overarm loosely in the end of the arbor. Allow about 1/32 in., which will be enough to prevent the arbor from being permanently sprung and still allow enough end movement for it to be loosened so that it can easily be withdrawn.



These two methods of removing arbors from the spindles of milling machines are both simple and effective, and will remove the most obstinate arbor without injury

In buying or making arbors, don't forget that there should be a generous fillet at the shoulder *D* to prevent fracture at that point.

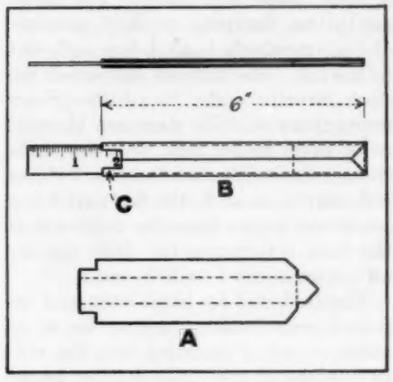
Stretching the Scale

JOHN A. HONEGGER

While I always carry a 6-in. scale, there are many times when a longer one is necessary. To get the value of a longer scale, I made a sheath for my 6-in. flexible scale out of cold-rolled sheet steel 0.006 in. thick, as shown in the illustration. The stock was cut out as at *A* and then bent as at *B*, making a snug fit for the scale.

After the sheath was made it was trimmed accurately 6 in. in over-all length. In measuring lengths more than 6 in., the scale is drawn out of the sheath the necessary distance, the reading being added to the 6-in. length of the sheath, as indicated by the edge of the open end of the sheath.

The opening *C* is for a finger hold in drawing out the scale. It also enables the user to see what figures or graduations are coming into view as the scale is drawn out.



Both the 6-in. sheath and the scale are used in combination when lengths of more than 6 in. are to be measured

Light-Gap Method of Truing Chucked Work

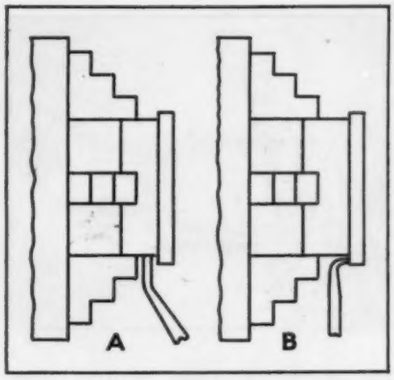
J. H. DAVIS
Wembley, Middlesex, England

While I use the light-gap method described by O. A. Wagner in an article under the above title (*AM*—Vol. 79, page 799), instead of a tool held in the toolpost, I use a surface gage, the base being placed on the compound rest. The spindle of the gage is removed and a pointer, one of the several shapes of which I made, is used in its place.

With the pointer in contact with the revolving work, the high spot pushes it away, permitting light to show between it and the low spot. To reflect the light upward, I use white paper laid on the cross slide.

If a tool has been set in the toolpost and it is not desired to remove it, the surface gage can be set on the carriage wing or on a plate laid across the ways. In that case the spindle of the surface gage is left in place so that the pointer attached to it can be set to center height.

In machining blanks for rolls or gears, they can be gripped in the chuck so that the bore, one side and part of outside can be machined, leaving a shoulder which should be squared. The blank is then reversed in the chuck, as shown. The work can be tested diametrically by placing the pointer as at *A*, and sidewise by a bent pointer placed against the squared shoulder, as at *B*. After the work has been trued in both directions, the shoulder can be turned off



A pointer held in the base of a surface gage placed on the compound rest is used to show the light gap between it and the low spot of the revolving work

and the exposed side can be faced with assurance that the two sides will be parallel.

Planer Fixture Swivels to Machine an Arc

J. R. WHITTLES

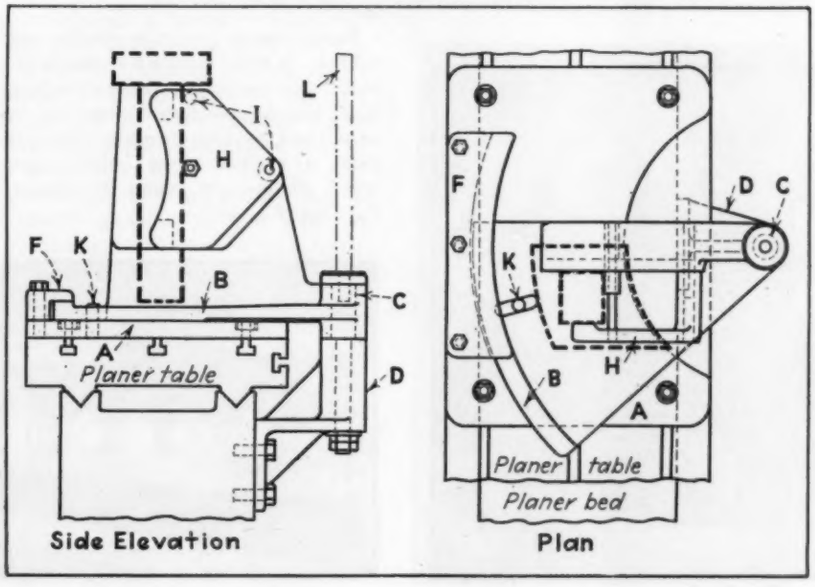
Some time ago we had to machine an arc on the head of a large T-shaped steel forging. The work was done in the planer because the forging was too high for any other machine in the shop, so we made the fixture illustrated.

The plate *A* is attached to the planer table and on it is mounted the swivel plate B, which is pivoted at *C*. The pivot pin is held in the bracket *D* attached to the side of the planer bed. Swivel plate *B* is in the shape of a segment and is held down on plate *A* by the circular gib *F*. The work, indicated by heavy dotted lines, is held by its shank to a vertical web on plate *B* by the three-point clamp *H*, which is held in place by pins *I*.

In operation, as the planer table travels back and forth, the drive pin *K*, held in plate *A* and engaging a slot in plate *B*, causes plate *B* to oscillate about the pivot *C* as a center, causing the work to move in an arc.

The rod *L*, extending upward from the pivot pin, is used as a center from which to measure the radius of the arc machined on the work.

Work held in this fixture is planed in an arc. Radius rods usually necessary for jobs of the kind are conspicuous by their absence

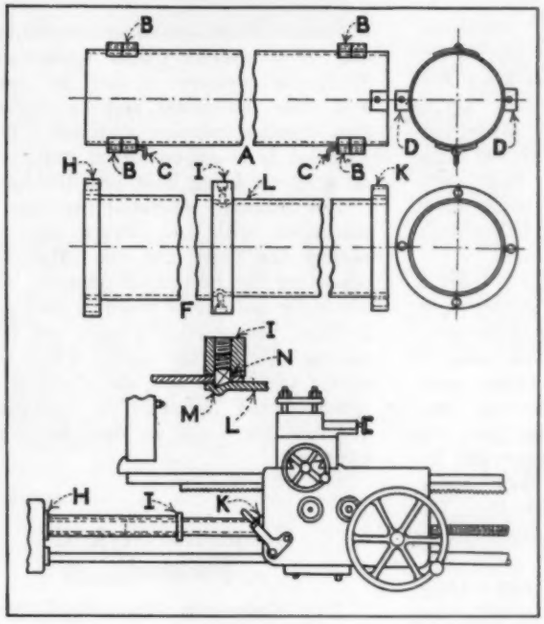


Guards for Leadscrews

R. G. HEWITT
Huddersfield, Yorkshire, England

While adequate protection is now afforded on most lathes against chips and dirt on the slides and ways, the leadscrews are left exposed. Good results can be obtained by inclosing only the part that is below the working area.

For lathes having a short longitudinal traverse, the guard shown at *A* will meet requirements. It is made of sheet metal and is in two sections so that it can easily be assembled over the leadscrew. Lugs at *B* are attached to both halves, the ones at the top being drilled for hinge pins, while those at the bottom are drilled for the locking pins *C*. Lugs *D* provide the means for attaching the guard to the lathe carriage.



By the telescopic guard illustrated, the leadscrew of a lathe can be protected from chips and dirt below the working area of the tool

For lathes having a long horizontal traverse, the telescopic guard shown at *F* is recommended. Steel tubing is used and is threaded to receive the flanges *H*, *I* and *K*. The inner sliding member *L* is an easy fit and is grooved at *M* for engagement of the square spring-actuated plungers *N* in flange *I*, which prevent the inner tube from coming out of the outer one when the guard is extended to its full length.

In the lower view, the guard is shown in place on a lathe, being attached by flanges *H* and *K* to the gearbox and the carriage, respectively. By making the guard with as many telescopic sections as are required by the length of the lathe, the leadscrew will be adequately protected below the working area of the tool, whatever the position of the carriage on the bed.

Shop Equipment NEWS

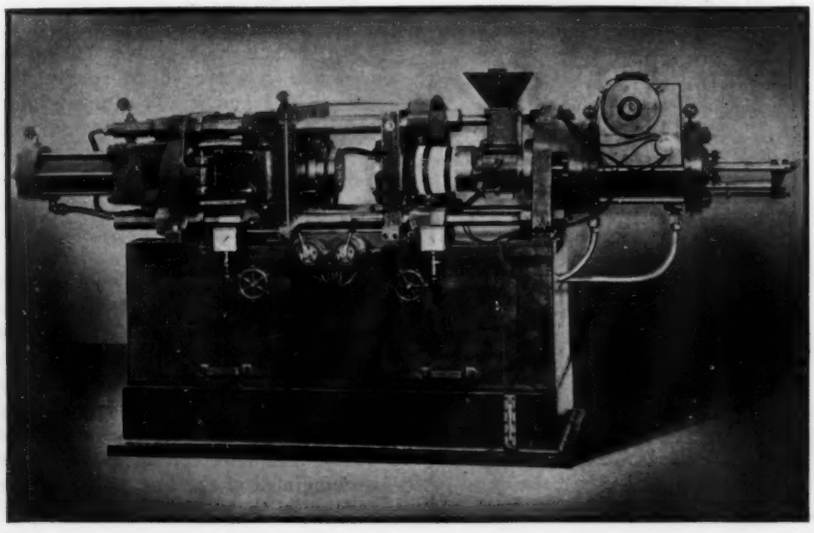
Reed-Prentice No. 10 Hydraulic Plastic Molding Machine

Reed-Prentice Corp., Worcester, Mass., has announced the No. 10 hydraulic, plastic injection-molding machine for the plastic industry. Up to 400 shots per hour can be made, giving a production of up to 500 cubic in. of molded material per hour, varying with the type of part being made. This unit is available for either manual or full-automatic operation.

Pressure on the material is adjustable from 2,000 to 10,000 lb. per sq.in. Die plates are 18x20 in. and die opening is 8 in. Maximum die space is 12 in.; minimum, 4 in. Other specifications are: space between bars, 12x12 in.; diameter of the bars, 2½ in.; capacity of feed hopper, 20 lb.; base area, 72x30 in.; floor space, 11½x3 ft.; weight, 7,600 lb. The maximum injection area capacity of the mold is 24 sq.in.

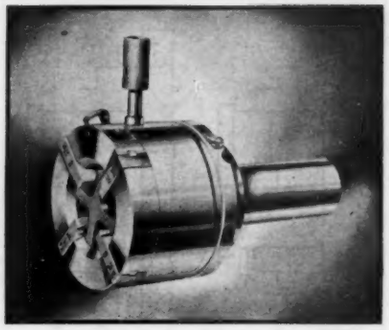
Standard equipment includes a 1,000-lb. Vickers hydraulic pump with valve control and an electric heating unit with regulating rheostat. Arrangements are made for mounting a thermometer or thermocouple on the heating unit. Molds are locked mechanically by a positive toggle mechanism. Hydraulic pressure is used to open and close the molds and to operate the injection plunger cylinder. The machine is a self-contained unit, the oil reservoir being built into the base.

The manually operated machine is controlled with two levers, one for closing the mold and the other for operating the horizontal plunger. On the fully automatic machine two adjustable timing control units are furnished; one for the period when the molds are closed and the material is being treated, the other for regulating the time the molds are open for work ejection.



Geometric Style C Dieheads

The Geometric Tool Co., New Haven, Conn., announces redesign of the Style C self-opening dieheads. It is now possible to convert one series of tools from an inside-trip diehead to an outside-trip type, or vice versa. This conversion is easily made through the application of only two or three parts. The Style C pull-off trip diehead has also been redesigned.



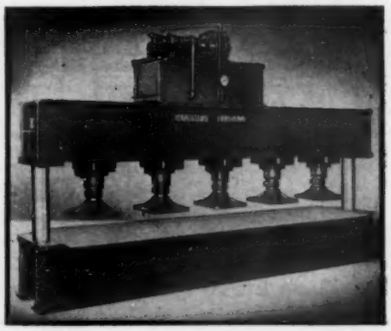
These tools are made of alloy steels, hardened and ground. Working parts are held to precise limits. Twenty-three sizes and types of these tools are carried in stock, with a cutting range from ⅜ to 6 in., inclusive.

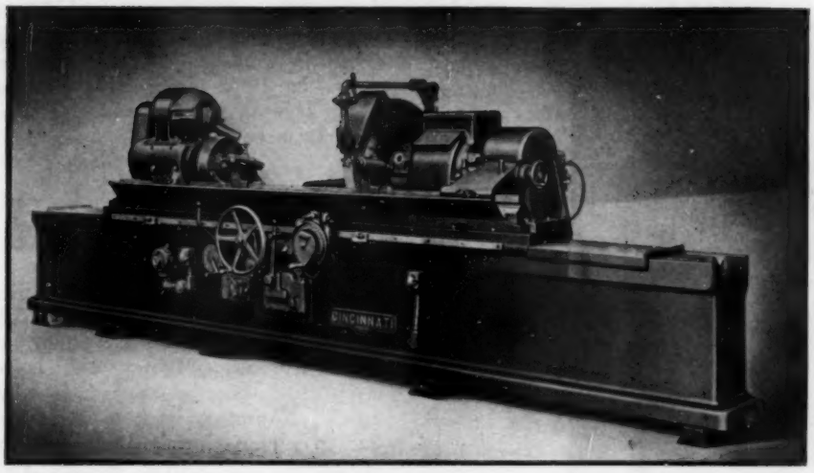
Hannifin 80-Ton Hydraulic Press

This 80-ton multiple-platen hydraulic press has been developed by Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill., for high-pressure gas testing of welded refrigerator body tanks on a production basis. Tanks being tested vary in size and thickness and require protection against deformation of top and bottom by test pressures.

Tanks are placed on the bed of the press and the necessary number of platens are moved down into contact with the tank top. Platens in use are automatically held in position at a predetermined pressure, regardless of the testing pressure applied inside the tank.

Each platen is individually controlled. A rapid advance stroke is provided until the platen touches the table, then the large-volume pump is bypassed and the high-pressure pump provides a predetermined holding pressure. Platens are raised by releasing the control lever.





Cincinnati Self-Contained Cylindrical Grinders

Plain, self-contained cylindrical grinders for 14- and 16-in. maximum work diameters are announced by Cincinnati Milling Machine & Cincinnati Grinders, Inc., Marburg and South St., Cincinnati, Ohio. They are built in standard between-center lengths ranging from 18 to 168 in.

The radial bearings in which the wheel spindle is mounted are of the load-compensating type and are equally effective for light or heavy cuts. A hydraulic device is available for wheel reciprocation if desired. Lubrication of spindle bearings is by means of a pressure system in which an individual, motor-driven pump circulates an ample volume of filtered oil. This pump motor is electrically interlocked with the spindle-drive motor through a pressure switch, assuring lubrication of spindle bearings while it is rotating. Main drive motors of more than 20 hp. are mounted on the floor. Smaller wheel-head motors are mounted on top of the wheel-head unit.

Drive for the headstock unit is similar in principle to that used on roll-grinding machines. Power is transmitted from a d.c. motor through V-belts to a jack-shaft, thence through silent chain to the headstock spindle. Where d.c. power is not available for operating the headstock motor, provision is made for mounting a motor-generator set on the machine. Twenty-four work speeds, from 40 to 160 r.p.m. for the 14-in. model and 25 to 100 r.p.m. for the 16-in. machine, are obtained by rheostat adjustment.

All control levers are conveniently grouped in front of the base, within easy reach of the operator. Table ways are pressure lubricated by a separate pump circuit. Table drive is derived from a separate motor that also drives the coolant pump. This motor is connected in the same circuit as the spindle-motor and is controlled by the same switch. Net weights of the machines vary from 11,500 to 27,500 lb., depending on size and center distance.

Hanna Electric-Hydraulic Riveter

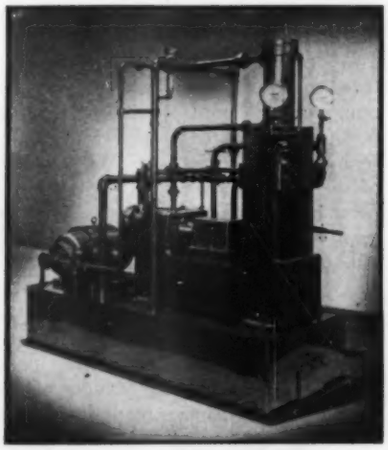
Available as portable or stationary units, the electric-hydraulic riveters announced by Hanna Engineering Works, 1764 Elston Ave., Chicago, Ill., are controlled by a trigger switch at the operator's finger tips. The power unit is a combination of a motor-driven primary pump, a valve mechanism and an intensifier. Fluid pressure developed by the power unit is transmitted to the riveter by flexible high-pressure hoses. It provides a rapid advance of the ram to the rivet, a proper driving speed and rapid return of the ram.

Depression of the control switch operates a solenoid-actuated valve, admitting low-pressure fluid to the riveter cylinder. When the rivet has been preformed to the limit of the primary pressure, the intensifier acts automatically to boost the pressure and finish the rivet. When maximum pressure has been applied, the control valve is automatically reversed, the ram is returned to its original position and the control valve is reset to the neutral position. Release of the trigger switch will immediately reverse the ram movement, whether primary or high pressure is being applied.

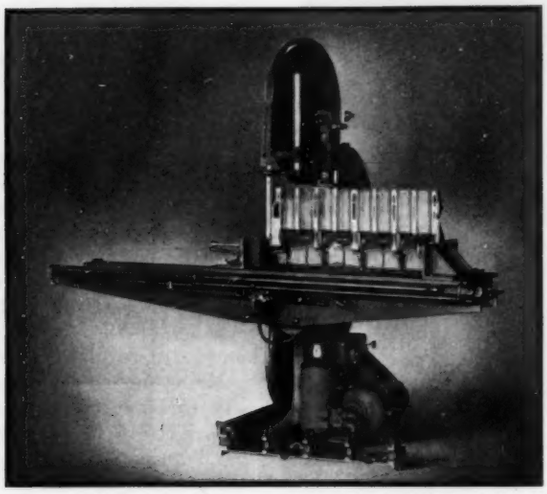
The unit illustrated exerts 20 tons on the dies and is capable of driving $\frac{3}{8}$-in. rivets, cold forming a full button head. Other units are available for driving rivets up to $1\frac{1}{8}$ in. hot.

Elmes Hydraulic Upsetting Presses

Charles F. Elmes Engineering Works, Morgan and Fulton St., Chicago, Ill., is offering a line of self-contained hydraulic upsetting presses in various sizes and capacities. These presses



can be used for upsetting bars and tubes and for forming operations that require split dies. An overhead cylinder is used for clamping the work while the horizontal ram performs the upsetting operation. Up to 30 strokes per minute can be made.



Laidlaw Type JM-30 Metal Cutting Bandsaw

Designed especially for cutting cylinder blocks for inspection purposes, this Type JM-30 metal cutting bandsaw has a double-cylinder hydraulic feed. It is similar to the standard Type JM bandsaws manufactured by William Laidlaw, Inc., Belmont, N. Y.

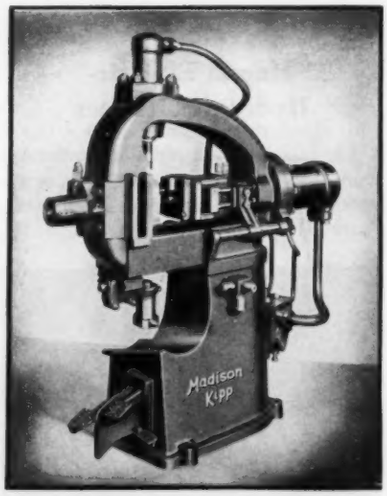
The JM-30 machine has 30-in. diameter wheels, a 18x8-in. table and a 40-in. carriage travel. A 16-ft., 1-in. wide saw blade, having 10 teeth per inch, is used. Other specifications are: capacity of vise, 40 in.; height from table top to upper saw guide in highest position, 19 in.; distance from floor to top of table, 36 in.; over-all height, 6 ft. 10 in.; floor space, 5x8 ft.; net weight, 2,000 lb.; motor size, 2 hp.

Madison-Kipp Brass Die-Casting Machine

Equipment for casting brass and rigid-analysis aluminum by the high-pressure method of casting metals in the plastic state, is announced by Madison-Kipp Corp., Madison, Wis. The equipment available includes three machines, five sizes of hydraulic pumping units and an electric holding furnace. All three machines are fully hydraulic in operation. Manufacture of these units in the United States and Canada is under exclusive license granted by the owners of Josef Polak's patents.

A novel feature of the plastic-metal type of casting machine is that the metal casting well is provided in each die. This well is made to provide a close fit for the forcing plunger of the machine. Provision is made in the machine for ejection of the casting from either the movable or the stationary half of the die. This permits more latitude than is usual in designing complicated dies and dies requiring special coring.

Model 256 casting machine, shown here, is equipped with hydraulic power unit No. P-2. Line pressures are up to



2,500 lb., which provides a die-holding pressure of 30,000 lb. and 7,700 lb. per sq.in. for the standard-diameter, metal-forcing plunger. Arrangements for higher plunger pressures can be made where necessary. Speed of travel of the forcing plunger may be regulated to suit casting conditions of various metals and for particular requirements of special dies. In larger machines, metal-forcing pressures may exceed 20,000 lb. per sq.in.

Metal for casting is held in a plastic stage in the electrically heated holding furnace. Almost any low-temperature metals having a plastic range can be cast. Hydraulic or mechanical core-pulling can be applied.

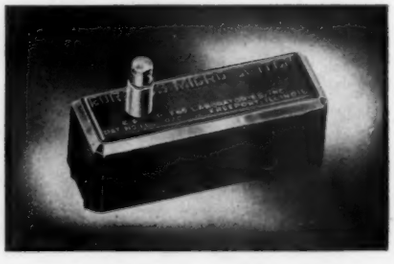
Park "Protex 2A" Protective Film

The Park Sales Co., 3 Park Place, New York, N. Y,, is offering to the American market a protective film for metal surfaces. "Protex 2A" is a liquid that can be applied to any article to protect it from scratches during manufacturing and packing operations and during storage and shipping. It is applied with a brush and dries in a few minutes. Removal is accomplished by moistening the surface slightly and then peeling off the film. "Protex 2A" is transparent and is available in two colors, blue and red.

C. F. Burgess "Micro Switch"

Improvements in the "Micro Switch," manufactured by C. F. Burgess Laboratories, Inc., Freeport, Ill., automatically limit overtravel so that a life of well over a million operations may be secured at full Underwriter's rating of 1,200 watts up to 600 volts, a.c. Two methods of actuation are available for all types of this switch. One is a leaf-spring operating lever which permits greater movement of the actuating force than is provided by the standard plunger. This spring can be given any shape or length required for special applications.

The second actuating device is a sleeve which fits over the standard operating plunger and actuates the switch through a spring in the cap. Using this arrangement, a differential pressure of four ounces, traveling through a distance of 0.0015 in. or less, will actuate the switch, just as it will without the spring cap. However, the spring provides for an overtravel of $\frac{1}{16}$ in. beyond the point of operation and thus protects the switch mechanism.



Oilgear Type "XM-80" Broaching Machine

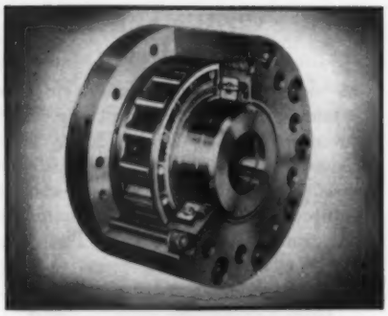
Three hundred finish-broached dynamo yokes, each 3⅞ in. diameter inside and 7 1/16 in. long, is the hourly production claimed for the Type "XM–80" Cyclematic broaching machine designed and manufactured by the Oilgear Company, 1403 West Bruce St., Milwaukee, Wis.

Two of these hot-rolled steel yokes, which are made from ½ in. flat steel-strip welded together, are finished broached per machine cycle. The broaches used are 58 in. long and the 52 teeth remove approximately 0.035 in. stock from each yoke. Yokes broached on this machine vary from 3 to 3⅞ in. inside diameter and from 6 to 7 1/16 in. in length.

This is the largest Cyclematic broaching machine ever built, having a peak broaching capacity of 120,000 lb. and a maximum stroke of 54 in. The over-all height of the machine is 187 in., the width is 68 in., and from front to back it measures 92 in. The normal broaching capacity is 80,000 lb.

In operating this machine all the operator has to do is load the two parts on the carriage table and then trip the pedal. The entire broaching operation, the handling of tools and ejection of finished pieces are all accomplished automatically. The broaches are secured at both ends during the critical part of the cycle.

The Cyclematic broaching machine, shown in the test pit, centralizes the work and threads it over the tools automatically



drive gear and restrained from the action of centrifugal forces by retainer rings supporting each end of the cams. The large number of cams permitted by this design offers the maximum capacity for a given clutch diameter, and provides smooth and immediate engagement at synchronization of driven and driving member speeds.

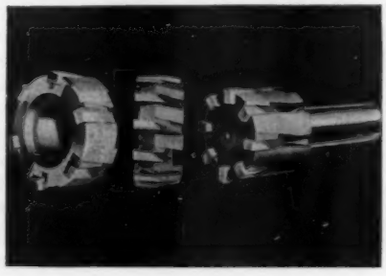
Several sizes are available, adapted to a range from ¼ to 100 hp. per 100 r.p.m. They can be provided with either the Morse Morflex rubber-insert coupling or the Morse chain coupling, when required.

Houghton "Acitrol 100" Pickling Inhibitor

E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., is marketing "Acitrol 100," a pickling inhibitor that is efficient at all pickling ranges and resists heat and time exposures. It is a pure chemical inhibitor which dissolves readily in either strong or weak acid solutions and leaves no greasy residue or stain on the steel. Its use is based on the principle of setting up an electrolytic insulating film where steel is attempting to dissolve, yet at the same time it has no retarding effect on the solution of scale.

Ingersoll Ray-Blade Core Drills and Reamers

The Ingersoll Milling Machine Co., Douglas and Willoughby St., Rockford, Ill., announces the application of the Ray type blade to core drills and reamers made either of the shell type or with a solid shank. The double-tapered Ray blades are positively locked against the thrust of the boring cut. When worn, they are easily reset any amount, moving outwardly for resizing and forward to compensate for wear of the cutting end. Locking is accomplished with a compensating serrated wedge.



Morse Kelpo-Type One-Way Clutch

The Morse Chain Co., division of Borg-Warner Corp., Detroit, Mich., is manufacturing the Kelpo-type free-wheeling or one-way clutch coupling for relieving driving or driven shaft loads. Its uses extend from ratchet feed mechanism drives to the clutch connection between large turbines, gas or electric motors and the units driven by these sources of power.

The Kelpo clutch provides low resistance to free-wheeling. This is accomplished by a series of individually sprung cams actuated by the main

Fafnir Special Duplex Bearings

Type "X" duplex ball bearings for high-speed spindle applications are announced by The Fafnir Bearing Co., New Britain, Conn. These bearings can be installed in one of three mounting arrangements—face-to-face, back-to-back, or tandem.

The unit consists of two matched, single-row bearings operated with the rings clamped tightly together. They are particularly applicable in providing extreme shaft rigidity for the vibrationless operation of high-speed spindles. These bearings are of the continuous raceway design and are fitted with composition retainers. Nine sizes and capacities are available.

Dodge "DR" Sheave For V-Belt Drive

A demountable-rim sheave for use in connection with V-belt drives is announced by the Dodge Mfg. Corp., Mishawaka, Ind. The "DR" sheave consists of a hub on which can be mounted rims of varying diameters and number of grooves. The rims

can be mounted in four different positions so that the hub can be approximately central or have varying amounts of offset as required. The hub is mounted permanently on the shaft and rims can be changed as often as required.

C-H Motor-Mounted Solenoid Brake

A totally inclosed, automatic solenoid brake for integral mounting with an electric motor is being manufactured by Cutler-Hammer, Inc., 205 N.

12th St., Milwaukee, Wis. This brake is available for use with fractional horsepower to 10-hp., 3,600-r.p.m. motors. It can be furnished already mounted with any motor, from the motor manufacturer. The rotating member, a single, heavy, molded disk, shows little wear on exhaustive tests. The inclosing case protects it from dirt and mechanical injury.

This brake is suitable for a.c. or d.c. applications and is available with dust-tight, weather-proof and water-tight inclosures. It is especially suitable for laundry, textile and woodworking machinery, and for hoists, elevators, dumb-waiters, machine tools and job presses.

Rod Straightener and Shear

Designed for straightening rods, bolts, wire and nails, the rod straightener and shear manufactured by The American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind., is made in capacities ranging from ¼ to 2½ in. in diameter. The straightening mechanism is composed of manganese-steel dies which close as a contracting square on the rod or bar and

deliver an impact on four sides simultaneously.

The ¼-in. capacity unit is hand operated, larger models are operated by compressed air and have a hand-control lever with which the force of the blow can be regulated. A gagger attachment is obtainable on several of the models. Cast steel is used for all parts except the cylinder parts, which are of cast iron. Operating costs are low as the machine does not require a skilled operator.

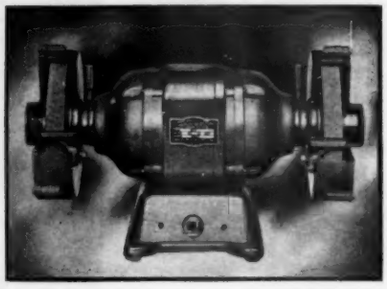
"Cronak" Process Protective Coating

The New Jersey Zinc Co., 160 Front St., New York, N. Y., has introduced a dichromate-film metal protective coating for zinc surfaces, known as the "Cronak" process. By using this process it is possible to largely eliminate the formation of bulky corrosion products on zinc and zinc-coated parts and to reduce the actual rate of corrosion of the metal. The process involves only a simple immersion treatment in an inexpensive acidified sodium-dichromate solution.

During this immersion, chemical reaction between the zinc and the solution causes the deposition on the surface of the metal of an insoluble film. This film contains a sufficient amount of a slightly soluble corrosion inhibiting material to protect the zinc surface when moisture comes in contact with it.

Baldor No. 3240 Bench-Type Grinder

A ½-hp., bench-type grinder, powered with a capacitor-type motor, is announced by the Baldor Electric Co., 4357 Duncan Ave., St. Louis, Mo. Designated as Type No. 3240, this

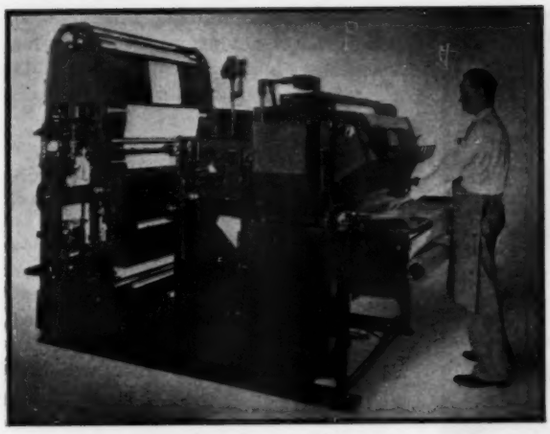


grinder has two 7 x 1 x ⅝ in. wheels. The motor frame is designed to provide clearance for grinding long or odd-shaped pieces. Wheel guards are of the closed type and toolrests are adjustable.

Pease Model "27" Blue-Printers

The C. F. Pease Co., 813–821 N. Franklin St., Chicago, Ill., has announced development of the Model "27" continuous blue-printing machines. These units will produce blueprints, negatives, blue-line or brown-line prints at a production speed up to 14 ft. per min.

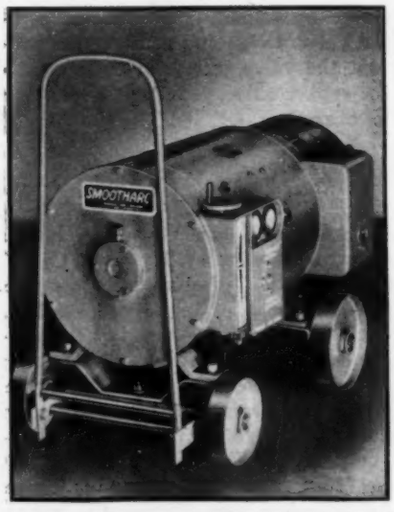
The blue-printing machine is available as a separate unit or in combination with the Model "27" radiator type washing, developing and drying unit. It is also available in combination with the Model "27-D" double-drum type washing, developing and drying unit. Either combination is available in two sizes, to accommodate all widths of sensitized paper or cloth up to either 42- or 54-in. wide. Re-



Pease Model "27" blue-printing unit features a twin-oven, air-type dryer with a floating idler roll that permits accurate heat regulation

production can be performed with cut sheets or with a continuous roll of paper.

Paper and tracings are fed in together at the front of the machine. Exposure is accomplished by means of a series of high-power "Actinic" inclosed arc lamps. Electrically- or gas-heated elements are provided in both the radiator type and the double-drum ironing-type dryers. Production speed through the Model "27" combination unit is variable from 8 in. to 13 ft. per min. The Model "27–D" combination is adjustable from 8 in. to 14 ft. per min.



P. & H. "Smootharc" Self-Excited Welder

The Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis., offers a line of P. & H. "Smootharc" welders that feature simplified design, single current control self-excitation and internal stabilization. These welders are built in both vertical and horizontal types for either stationary or portable mounting. Vertical units are available in 75-, 100- and 150-amp. capacities. Horizontal units come in 200-, 300-, 400- and 600-amp. capacities.

All of these units are provided with a single current control by which generator brushes are shifted with a patented mechanism. Voltage regulation is automatic permitting fast welding.

Manhattan Condor Compensated Belt

Styles "F" and "B" Condor compensated belts, recently announced by the Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., Passaic, N. J., are especially designed for those unusual conditions which require some belt slippage. Both have the Condor compensated principle of equalized-ply stresses at the arc of contact.

Style "F" has a red friction pulley surface and is designed for use where a slight starting slip is desired. Style "B" has an untreated duck pulley surface suitable for conditions calling for a greater slip, or where slip is essential, as in the case of winder drives. These belts differ from the regular Condor belts only in belt surface.

Bonney Forge Soft-Face Hammer

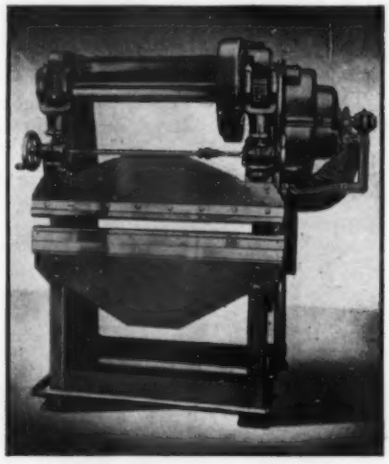
A line of soft-face hammers is announced by Bonney Forge & Tool Works, Allentown, Pa. The tips of the hammers are of a tough, amber-colored composition material that will

not shatter, chip or break. In the event that the tips become badly worn, the old tip can be removed with a pipe wrench and a new tip pressed in place.

The hammers are properly balanced and the hickory handle is securely locked in the head. Available in 1½-oz., ½-lb. and 1-lb. sizes, these hammers are useful for fitting bushings, pins and for similar work where the surface must not be damaged.

Whitney-Jensen 4-Ft. Press Brake

The Whitney Metal Tool Co., 105 Mill St., Rockford, Ill., has introduced the Whitney-Jensen No. 47-4 ft. power press brake. This machine has a ca-



pacity for making a right-angle bend 48 in. long in 14-gage mild steel.

Housings and bedplate are fabricated of mild steel plate, reinforced with truss rods. The ram is a single 2 by 12 in. plate. The machine is double back-geared and is powered with a 3-hp. motor. Die surface is 50 in. long and the clear distance between housings is 37 in. There is a 6½ in. throat clearance from the center of the dies. Stroke is 2¼ in. Adjustment to the ram is 3¼ in. Stroke speed can be adjusted from 20 to 54 strokes per min.

Brightening Agent for Zinc Plating

The R. & H. Chemicals Dept., E. I. duPont de Nemours & Co., Inc., Wilmington, Del., has announced an improved brightening agent for use with the duPont bright-zinc barrel-plating process. The agent is now introduced into the plating solution instead of being used in a separate bath, thus saving an operation. Shallow or deep recesses can be given the

same luster as high lights without sacrificing throwing power.

With the brighter deposit the surface retains the resistance to staining that featured zinc coatings previously produced. The brightening agent is a liquid easy to handle and control in the process.

Cover No. 24 Respirator

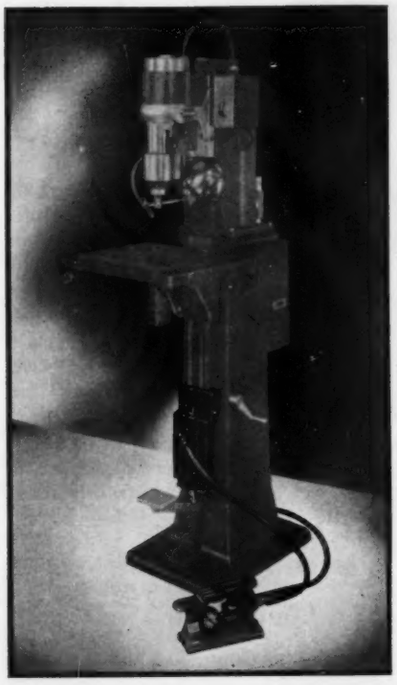
No. 24 Dupor Plate respirator, announced by H. S. Cover, Station "A", South Bend, Ind., is of the bulb-valve type and has a filter area of more than 24 sq. in. Dead-air space is cut to a minimum. This respirator has the U. S. Bureau of Mines approval No. B.M.-2111, for use in type "A" pneuconiosis producing dusts.

The face piece is of standard Dupor construction with large off-set filter

plates attached. Filtered air passes easily between the plate extrusions to the protected opening and into the interior of the respirator. Filter pads are securely anchored by a locking device that prevents leakage. Vision is not obstructed and the light weight insures wearer comfort.

Air Control For Haskins Tappers

An air control has been developed by the R. G. Haskins Co., 4630 W. Fulton St., Chicago, Ill., for use with their tapping machines. This unit is designed to increase the sensitivity and accuracy of Haskins tappers and to reduce operator fatigue. Speed of feeding and reversing the tap is controlled and a uniform pressure is



maintained throughout the tapping cycle.

The control unit consists of an air cylinder mounted on the machine column above the treadle. This cylinder operates the feed by means of a plunger. Control is effected by a foot-operated valve which is connected to a source of compressed air. Applied pressure is regulated at the foot valve.

Ideal Hand-Type Commutator Scraper

A swivel-type hand slotter and scraper for commutators is announced by the Ideal Commutator Dresser Co., 1439 Park Avenue, Sycamore, Ill. The swiveling head is circular in form and the opposite faces have interlocking notches. These notches permit locking the scraping bit at the proper angle by tightening a lock screw. Being

free of projections the scraper head can be used in close quarters. Stem and handle are in one piece and are of high-strength bronze. The handle is hollow to balance the tool.

One end of the hardened tool bit is ground for V-slots, the other for U-slots. Besides cleaning and beveling slots in commutators, this tool is handy for removing mica fins and for smoothing burrs on copper segments close to the commutator risers.

DeVilbiss Type HFS Sensitive Regulator

The DeVilbiss Co., Toledo, Ohio, has announced the Type HFS low-capacity regulator for sensitive regulation of air pressures below 30 lb. Regulated air pressure can be graduated up to 30 lb. with but one ounce variation for each 10 lb. variation in main line

pressure. The 4-in. diameter diaphram is clamped in the regulator body between two brass castings fastened together by radially spaced bolts. Special valve design and construction prevent the valve seat from cutting into the rubber valve. The unit is positive in operation.

"Hy-Speed Case"

The A. F. Holden Co., New Haven, Conn., is introducing "Hy-Speed Case," a combination of pure salts for the heat-treatment of high-speed steel. A balanced case is obtained which includes some carburizing effect along with a sufficient amount of nitride needles. Maximum hardness with minimum brittleness is claimed. Melting point of Hy-Speed Case is 700 to 720 F., and the hardening range for secondary heat-treatment is 900 to 1,100 F.

Tools to be put through this process must be hardened, tempered and ground to size. A secondary grinding operation would remove the shallow depth of case which this treatment provides. Tool life between grinds will be increased from two to ten times the normal life.

The Round Table

SOMETHING FOR NOTHING?

"Who's the glad hand artist you've got out in the shop, Al? I don't think I ever saw him before."

"Guess you didn't, at that, Ed. He's an experiment."

"Where did you dig him up? Or is he just an excuse to spend more money and avoid income tax?"

"Neither, Ed. He dug himself up. Came to me the other day with a proposition that was new—and interesting."

"Such as?"

"He's a bit older than he looks Ed, and he's had a lot of experience. Gave me references that checked O. K."

"How much is this paragon going to cost?"

"Not a cent, Ed. That's the beauty of it."

"So you still believe in Santa Claus!"

"When Santa comes and offers me more output at no extra cost—not even a drawing account—I'm listening."

"Better tell papa all about it, Al, and you'll feel better. I hope I will too."

"It's this way Ed. Tom—his last name is Bings—came here about a month ago, and asked if I minded if he looked around the shop a bit. Of course, I didn't. He took plenty of time—got an eyeful of our work and methods—and went away."

"Next day he came back with a proposition that sounded goofy, but I saw he was in earnest. So I listened."

"And you fell for it, Al?"

"I sure did, Ed. His proposal was something like this. He saw several places where money could be saved in operations. Some of the men weren't on to the possibilities of their machines, and he said he'd work for nothing until I was satisfied he knew his job."

"Then what—I knew there was a catch in it."

"Then he gets half the savings in cost for the first year, beginning from his starting date."

"Who gets the other half?"

"The men get it—divided pro rata according to their wages."

"So that's how he speeds 'em up eh? Hanging carrots in front of the donkey's nose."

"Bonus sounds better than carrots, Ed, and the men eat it up. He knows how to keep them happy. Personality, I guess you call it."

"They'll get tired of working at high pressure, Al, and we'll be holding the bag."

"Funny part of it is, Ed, he sold them on the idea of making the work easier, and he seems to be doing it. He's showing them more tricks in handling work and tools than I ever saw before. They're all for him."

"What do we get out of it, Al, if all the savings go to him and the men?"

"More production from the same plant, Ed. And perhaps a different deal next year."

Does Al stand to gain or lose in long run? Or is Ed right in being suspicious?

DISCUSSION

Bonuses for Toolmakers

Certainly toolmakers should receive a bonus, if that is the only way in which they can receive proper compensation for their skill and importance in industry. Al may be right when he says that the toolmaker is an artist and receives his reward in knowing that his work is well done, but the butcher, the baker and the candlestick maker soon make him a materialist.

The toolmaker is proud of ability to do his work in the best possible man-

ner, but, if his bonus is to be based upon speed, few can resist the temptation to slight their work here and there. I have seen this happen in shops that paid bonuses for speed.

If industry continues to pay its unskilled help as much as its skilled help, it will find itself suffering from a greater shortage of skilled labor than now exists. It will become more and more difficult to get young men to spend three or four years learning a trade which will not pay them any more or as much as they could earn in a few months.

Yes, give them a bonus if you must, but give it to them at once, not after the tool is worn out as suggested. Make the basis and method of calculating this bonus as simple as possible. The complicated wage-incentive plans now in operation in many plants are not readily understood by the average worker. Without complete understanding of the method, dissatisfaction is bound to exist.

The better plan is to pay toolmakers at least as much as the unskilled worker. Then the plant can be assured of a supply of skilled help, by attracting young men of high caliber to learn the trade. It will pay big dividends in better tools and satisfied toolmakers.

—O. W. SCHRICKER.

It is practically certain that any such bonus system as Al has described would open the door to a host of evils. Ed has aptly pointed out that a man might be laid off before he could collect all that was due him, but he failed to mention what a bone of contention job assignments would be. A man who failed to earn a bonus on a given job would think he had been handed a lemon.

It does not follow, however, that the bonus system cannot be applied to the toolroom crew as a group. It would eliminate the watching of each individual job and would cut down on the clerical work. An average standard for the toolroom could be established and, if and when it is exceeded during any period of time, a bonus could be given to the toolroom crew as a whole and equitably distributed.

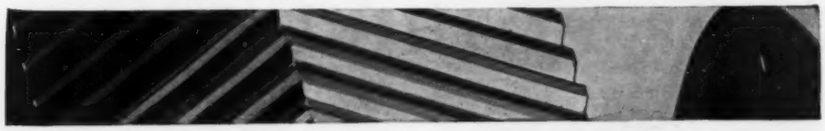
A group bonus system would beget cooperation among the men, whereas the single-unit bonus system would result in the opposite. Under the group bonus system, the occasional shirker would not shirk long before he would understand that the other men resented it. In most cases, everyone would go out of his way to help the other fellow, knowing that he was helping himself by so doing.

—JOHN E. HYLER,
R. G. Le Tourneau, Inc.

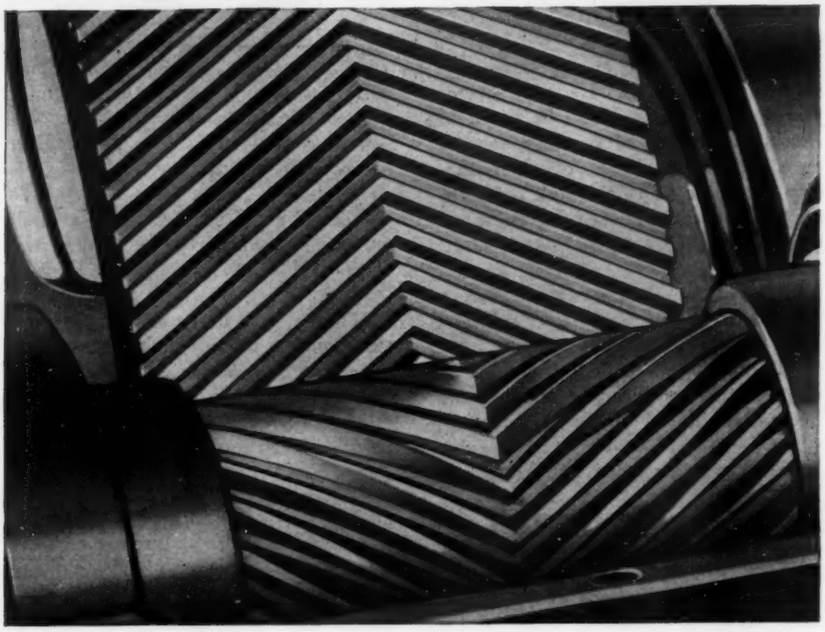
A system of pay whereby a tool or diemaker receives a bonus for beating a set time, plus a bonus for die performance sounds like a well-worked out idea, but it would leave much to be desired in practice.

The many factors over which the diemaker has no control that might affect the performance of a die, and the lapse of time before he knows the full amount of his pay, would tend to provoke dissatisfaction. If a system of pay offers sufficient inducement for the diemaker to lop off 10 per cent of the cost of a die, it might cause a 25-per cent reduction in its quality.

A diemaker should receive more pay than a press operator, regardless of



SMOOTH POWER



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the piece rate or bonus system used in the press department, because of the difference in the skill required, and because of the important part the diemaker plays in producing a tool of high-productive capacity that can be used by a comparatively unskilled man.

The rate of pay should be commensurate with the skill that is essential to the trade and should not be cluttered up with a lot of pressure features for a task that requires painstaking care. The desired results should be obtained by careful selection of men and a fair rate of pay.

Ed may be right that toolmakers are artists, but there must be economic justification for their artistry.

—Wm. R. Morgan.

Tools for Every Job

The expense of duplicate tools and their upkeep will outweigh any saving in time gained by maintaining sets of tools for every job. There are few exceptions such as (*a*) drills that must be of certain lengths to avoid machine adjustments, or (*b*) cutters for machining several duplicate pieces at the same time, when the tools must be the same size.

When a set of tools is returned from the shop, there is the possibility that some of the standard tools will not be placed with the set. Invariably, drills and cutting tools require grinding, while the jigs and fixtures require checking. Thus, the set must be separated and may not be reassembled correctly.

Special tools, clearly marked as such, should be stored in their proper bins. Standard tools are more easily stored by size and type.

In present shop practice a copy of the work or operation slip is given with each job, and this usually contains a list of the necessary tools. This slip when presented at the tool crib, will enable the attendant to get the complete set ready while the man sets up his machine. Any changes in the job concerning standard tools will be taken care of on these slips, avoiding extra tool handling. —Karl Eck.

Good as New?

It is my belief that machine tools should have the same careful consideration as the other factors that enter into a business enterprise. In many instances it will be found that a rebuilt machine will serve the purpose equally as well as a new machine. Especially is this true where production is not the prime requisite. Where quality has to be considered there is a possibility that the rebuilt machine, operating at slower speed than the new machine, can produce better work.

When mass production is required, then it is new, high-speed equipment that can show the greater profit. A study of the rebuilt and new equipment will generally determine the proper course. When making such a study it is well to take into consideration the production speeds of the rebuilt versus the new equipment and the amount of investment required for new equipment as against rebuilt equipment.

It depends entirely on the results desired. The sooner we learn to equip our plants so that we have "tailor made" machines, that is, machines to fit the jobs, which we put upon them, the sooner our profits will grow.

—Roger C. Dickey,
The International Paper Box Machine Company.

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The Pyramids—everlasting symbol of man's unceasing desire to build for the future—to make better things—things that will last. Machines or tools cannot be built to last forever. They can be made to last longer by careful selection of material, proper design, improved production methods and heat treatment. Jacobs Chucks are made to the highest standards, that assure to you the maximum life and wearing quality in their use.

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Chatter Does Matter

WILLIAM P. CASPER

I have a high regard for a time-and-motion-study man who knows his business, but some of these lily-fingered clockers, who can't tell a rose reamer from a spanner wrench, get under my skin.

J. D. Relyea writes (*AM*—Vol. 80, page 651) that the time-study man in his plant saved $10 per thousand cast aluminum agitators by boring them at the highest speed possible on the lathe. He stated that chatter resulted but was of no moment because a bushing was later driven into the hole.

May I take exception? I was chief inspector of a washing machine plant for three years and in that time was intimately concerned with the machining of around 150,000 cast aluminum agitators and believe I know whereof I speak.

In the first place, the proper cutting speed of cast aluminum depends upon its age. Seasoned castings will machine much easier than green ones—three months age increasing machinability about ten per cent. Chatter marks in the boring operation show in this case that the speed was excessive for the material.

Mr. Relyea remarks that the chatter marks did not mean a thing. I wonder if he has ever tried to hold a hole to gage size or keep it round when the boring tool was chattering. Any machinist knows that no set-up can be relied upon when tools chatter. Suppose a scrap increase of one per cent was caused by the excessive speed—the cost of ten agitators per thousand would more than offset the $10 saved by speeding up the lathe.

Speeds and feeds are so intimately related with the material being turned and the tools used that no one can lay down a hard and fast rule of procedure. Experience is advisable, but the fact that there are higher speeds on a lathe than the one being used does not mean that the machine is loafing. Much has been done toward speeding up production by quick loading and unloading fixtures, by revised tool set-ups and by the introduction of carbide tools—but the prime idea behind this improvement is to secure faster machining with better finishes. Chattering tools are relics of a by-gone era.

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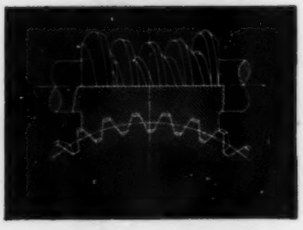
Forty million miles in 3000 cars without a single failure or replacement due to wear—continuous operation at 30,000 R.P.M.—intermittent extreme load operation at four revolutions per hour—are examples of standard conditions under which Cone Worm Gearing is operating. The whole secret of the success of Cone Gearing lies in the novel and exclusive manufacturing process which has placed it on a production basis.

Available in sizes from one inch to several feet in diameter—in ratios ranging from 1 to 1 to 150 to 1—and in quantities up to a million or more.

Literature, quotations or information on manufacturing licenses on request.



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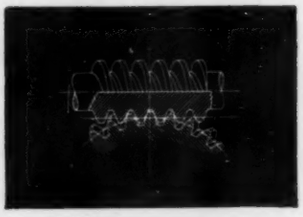

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NEW BOOKS

PUNCHES AND DIES—*Second Edition. By Frank A. Stanley, consulting editor, Western Machinery and Steel World. 476 pages, 6 x 9 in. Indexed and illustrated. Clothboard binding. Published by the McGraw-Hill Book Company, 330 West 42 St., New York, N. Y. Price $4.00.*

While principles of die design have changed little since Mr. Stanley brought out his first edition in 1919, details of construction are decidedly differently. Dies run to much larger sizes, are more accurate, and because of long production runs, must have increased durability.

To take account of these trends in the new edition, some sections have been extensively rewritten and some new ones have been added. Modern illustrations have been included as additional material or to replace those showing older types of tools.